

JOHN SHAW BILLINGS:
SCIENCE AND MEDICINE
IN THE GILDED AGE



JAMES H. CASSEDY

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Contents

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Introduction

Much has been written about John Shaw Billings (1838-1913) as a founder and builder of two great American libraries—the Army Medical Library and the New York Public Library—and of the pioneering Johns Hopkins Hospital. In fact, for various reasons, Billings's biographers have concentrated their scholarly attentions very largely on the details of those particular career accomplishments, thus giving extremely short shrift to a cluster of other major accomplishments for which Billings also gained great distinction during his lifetime. This book is intended to supplement or reverse the emphasis of those early studies by focussing principally on those neglected initiatives and pursuits, most of them scientific in nature.

Accordingly, the book is an exploration of Billings's roles as one of the most productive scientific and administrative leaders of the so-called “medical revolution” and the often closely related public health movement of post-Civil War America. As part of this, I aim to portray Billings as a participant in and major exponent of the period's substantially growing federal presence, specifically the expansion of federal authority in health policy, medical institution-forming, and scientific ventures. In addition, I have presented the scientifically knowledgeable bureaucrat Billings as an authoritative and persuasive link between these federal health initiatives and the often separate worlds of private medicine and local public health. His individual scientific contributions, meanwhile, were products of the private world as much as of the governmental environment.

I have not intended the volume to be a new biography of John Shaw Billings except in a limited sense. It makes no pretense of digging into the lives of Billings's forbears, of following the steps of his education, or of tracing very much of his family and social life. It does not deal in detail, either with his Civil War surgical and hospital experiences or with his post-1895 activities with the New York Public Library and the Carnegie Institution of Washington.

Instead, I have concentrated upon the thirty-year time span of Billings's career as a medical officer in the Washington office of the Army Surgeon

General between 1865 and 1895, a period in which he was no longer involved in providing medical care to the troops. Given that freedom, Billings was enabled, at intervals between several highly challenging special Army assignments, to take advantage of other exceptional career opportunities both within and outside of the federal government. Some of those gave him immense influence and authority nationwide. But to bring them about, he had to make himself into what was a rarity among medical men, in this case, a surgeon who ultimately combined in one person the productive scientist, the energetic administrator, the planner and builder, the organizer and expert of a number of large scale medical and public health activities and institutions. Wearing these many hats, and enjoying the authority of the military, Billings had an enviable succession of accomplishments during these years, achievements that brought an abundance of honors, at home and abroad. At the same time, for some contemporaries, his relentless search for medical and scientific books and his vigorous organizational methods inevitably suggested to some extent the acquisitive traits of gilded age industrialists, bankers, and empire builders.

I have not presented Billings's medical, health-related, and scientific pursuits through this thirty-year period in a strictly chronological manner. Rather, the work is composed of a series of more or less independent essays or chapters that are linked by a number of themes. Among these motifs are those of the growing introduction of science, statistics, and technology in medicine and public health; the continuing positive support given to Billings by the Army Medical Department; the extension of health professionalism; and the processes of adjustment during the transition between the sanitary era and that of bacteriology. However, the dominant theme through the book will be that of Billings's forceful, highly informed, and confident impact on his superiors as well as his peers, his energizing of change in American medicine and public health through a bulldog-like insistence on adopting scientific ideas and administrative solutions within the frameworks of government, society, and professions.

I have made no effort to treat several of Billings's most noted achievements or institutions exhaustively, particularly those that have previously received considerable scholarly attention. Rather, my handling of such topics has been selective or in summary form unless there were corrections to be made or original material to introduce. For instance, I have deliberately not discussed the early Johns Hopkins Hospital in its entirety, but principally as it demonstrated Billings's interest in design as a health factor and also as it became a climax in the Army's development of model hospitals. With the

Surgeon General's Library, in turn, in contrast to many previous authors, I have not attempted to deal substantially either with Billings's routine activities in the library or with his exceptional innovations as a bibliographer. Rather, I have emphasized the library's importance to professionals in medicine and the health sciences as well as Billings's roles as the library's builder and continuing publicist. I have also emphasized the library's critical role in medical change, particularly as a prime agent in circulating the impulses of the medical revolution in the United States.

Acknowledgments

In preparing this book, I have relied especially upon the large collections of Billings's papers and publications at the National Library of Medicine and the New York Public Library, and to a lesser extent on collections at other libraries. Access to these materials would have been difficult or impossible without the assistance of the librarians at all of them.

I owe a large debt to the authors of the two principal biographies of Billings. Fielding H. Garrison, in his *John Shaw Billings, A Memoir* (1915), produced a literate, penetrating, and charmingly urbane account of the man and his times, one which gained in authenticity and interest with its extensive selections from the Billings papers, and thus became a valuable primary source in itself. The biography by Carleton Chapman, *Order Out of Chaos: John Shaw Billings and America's Coming of Age* (1994), is likewise an invaluable source of much interesting, valuable, and hard-to-find detail from a broad range of sources. Both works made it possible for me to concentrate on portions of the Billings story that their authors were not concerned with to any significant extent.

In addition to the biographies, a number of institutional histories contain long and valuable sections on special phases of Billings's career. These include Phyllis Dain's history of the New York Public Library and two works by Wyndham Miles, one of them a history of the National Library of Medicine, and the other a study of the National Board of Health. Among the journal articles and other secondary works, I cite a considerable number of the most important and useful in the end-notes of the respective chapters.

Over a span of years, I have greatly valued the lively interest that scholars, past and present, have taken in the various portions of this project. In addition, I have welcomed the give and take of scholarly discussion and comments that resulted from the various papers on Billings that I have presented at professional meetings.

I especially thank my colleagues in the History of Medicine Division of the National Library of Medicine for generous assistance of various kinds. Young Rhee has provided invaluable guidance on using my computer and

in keeping it running. Margaret Kaiser, Betsy Tunis, Stephen Greenberg, Karen Pitts, Roxanne Beatty, and others have made innumerable searches for Billings materials in the stacks, sometimes beyond the call of duty. Two former staff historians, Manfred Wasserman and Wyndham Miles, have shared their extensive knowledge of Billings with me as well as important materials from their private collections. At the same time, a succession of the scholar-chiefs of the History of Medicine Division—John Blake, John Parascandola, and Elizabeth Fee,—together with Phil Teigen, have appreciated the importance of the Billings project and have gone out of their way to assist it. I am also grateful to them and to other officials of this library for making it possible for me to have the necessary time for research and writing and for providing the project with substantial material support. In addition, employees in other divisions of the library have been encouraging with their interest, often by attending my occasional seminars and lectures on the library's founding father and icon, John Shaw Billings. Finally, I am grateful to Carol Clausen for endless support, both in and away from NLM. Not least, she listened patiently to ten years of Billings anecdotes.

Chapter 1

Thirty Years in the Army Medical Department

Between 1865 and 1895, John Shaw Billings, a career army medical officer, occupied a senior staff position in Washington, D.C., in the office of the Surgeon-General of the American Army. In this position, along with a handful of other senior officers, he assisted a succession of surgeons-general in running the post-Civil War Army's Medical Department, still the country's largest medical or health-related organization. However, for all but the first few months of Billings's period of service in it, the Medical Department could not be compared in budget and size of its operations with those of the gigantic wartime medical empire that it succeeded. It was, rather, a period of belt-tightening, of making do with less, of looking for expedients, of piling more work on talented and dedicated staff members.

Despite the difficulties, the energies and creativeness of this small band of aides enabled the Surgeon-General's office to remain a major center of medical and public health activity in late nineteenth century America. A large factor in making this possible proved to be the staff officers' collective interest in and receptiveness to the century's wave of new scientific discoveries, methods and ideas related to medicine and health. In this and other ways, the senior staff thus from the beginning provided Billings with a strong supportive environment, especially for his extensive science-related investigations and innovations.

This chapter outlines the basic chronology of Billings's lengthy Army life along with short profiles of some of those individuals with whom he was associated with at that time. As such, it is intended to indicate the institutional and human framework within which he carried out many of his professional and science-related activities. Because of its primary function as a reminder of dates and synthesis of mostly familiar information, I have drawn the chapter heavily from standard secondary sources. However, the selection, emphasis, arrangement, and interpretation of material is my own.

An Army Surgeon becomes a Medical Administrator

At the very end of December 1864, the Union Army's Surgeon-General, Joseph K. Barnes, transferred Billings, then a 26 year old Assistant Surgeon, from service elsewhere in the army to duty in his office in Washington, D.C. He by no means intended Billings to be his personal aide-de-camp. Rather, he badly needed an upper level administrator. Barnes evidently had given much thought to this selection. With the Civil War slowly drawing to a close, he especially needed someone who, in the beginning, would be able to organize and manage the imminent demobilization of the Medical Department, and who could later plan and assume the management of other large projects. John Billings was clearly an officer with many such capabilities, and Barnes already knew a good deal about them.¹

Billings had come to the Medical Department early in the Civil War with a record of having made the most of his sparse opportunities as a youth and young man, most of them in middle America. In the tiny community of Allensville, in rural southeast Indiana, he had voraciously read everything he could find that might illuminate the world beyond the limited economic, geographical, and intellectual confines of the family home and village, and he had made up his mind early that he did not want to be a farmer. As with many youths of his generation, Billings's early education, according to Carleton Chapman, seems to have been "haphazard." However, it was augmented through some tutoring in Latin and Greek by the family's Presbyterian minister, who found Billings to be a rapid learner with an unusually retentive memory. With that preparation, and with tuition fees apparently scraped together with difficulty by his father, owner of a small general store, he went on, during the 1850s, to obtain a classical education at Miami University, a few miles away in Oxford, Ohio. After graduation, he spent a year earning enough money to be able to go to medical school.

While Billings's horizons were broadened by the years at Miami, they expanded still further between 1858 and 1861, in Cincinnati. There, for the first time, he lived in a sizeable urban center (160,000 in 1860),

¹ Except where otherwise indicated, many details in this chapter are drawn from or based upon Carleton B. Chapman, *Order Out of Chaos: John Shaw Billings and America's Coming of Age* (Boston: Boston Medical Library, 1994); and on Fielding H. Garrison, *John Shaw Billings: A Memoir* (New York: G. P. Putnam's Sons, 1915).

one with abundant cultural and educational institutions, with passionate debates going on over the slavery issue and over religious matters, and with vigorous commercial and industrial activity. The city's continuing growth, in fact, was attested to by the arrivals of foreign immigrants and other new inhabitants, facilitated by Cincinnati's bustling river transport and by several major railway lines.

Of special significance for Billings, Cincinnati was relatively well supplied with most of the resources then considered necessary for the formal study and pursuit of medicine. It had a number of hospitals and an active board of health. Physicians, not only the regulars but those belonging to the current irregular medical bodies—eclectics, homeopaths and others—met in their separate medical societies in the city, while one or more of these groups published medical journals. There were also three medical schools. In 1858 Billings entered the oldest of these, The Medical School of Ohio, and over the next two years took the prescribed two full courses of lectures in the school buildings. He attended the surgical and clinical lectures at various hospitals, and during his second year served as interne at one of them, St. Johns Hotel for Invalids. Following graduation—he received his M.D. in March 1860—he was elected to the post of Resident Physician at Cincinnati's Commercial Hospital, where he remained about six months. The Medical School of Ohio then appointed him to be demonstrator of anatomy, a position he held until the fall of 1861, when he resigned to apply for a commission in the medical corps of the Union army.

Members of the Army Medical Department's examining board that evaluated Billings's application found that the instruction he had been provided with at the Ohio school ranked quite well compared with that at other American institutions. They held several of the school's individual faculty members in high esteem, and they were impressed with the supporting testimonials that the latter sent for Billings. Even more impressive was Billings's performance before the examining board in Washington, D.C. in November 1861, which gained top ranking for him among the candidates who were eventually accepted. Since the processing of new commissions was time consuming, he was first given a temporary appointment as a contract surgeon for a few months in early 1862. His ultimate commission as Assistant Surgeon and First Lieutenant, grades that he held throughout the war, was dated April 16 of that year.

Much of Billings's early experience in the Civil War was that of a military surgeon, though the authorities also often used him as a hospital administrator. He had varied assignments, first at back-of-the-lines general hospitals in or

near Washington and Philadelphia and later with front-line units of the Army of the Potomac that saw action at Gettysburg and Chancellorsville. However, in early 1864 he was removed almost entirely from further duty as surgeon or administrator of individual hospitals. In their place, he was given broader administrative duties on the staff of Thomas McParlin, Medical Director of the Army of the Potomac. His work there at first included some trouble-shooting tasks as an acting medical inspector. However, it steadily shifted to the sorting and analyzing of that Army's hospital statistics and the preparation of its medical reports, tasks that he found interesting and challenging. Most important of these was the detailed report that Billings prepared for McParlin on the diseases and medical activities of the Army of the Potomac during 1864.² It also proved significant in bringing more of his talents to the attention of Surgeon-General Barnes. In fact, it clinched the new position for him.

Actually, by then, Billings had come to be known to his superiors as close to being the ideal army medical officer. He was valued as a first-class operating surgeon, one who was not only rapid in his operations but careful, as one who more than once drove himself to exhaustion. And, as hospital administrator, he was known to be systematic, disciplined, resourceful, and generally cool. Barnes himself had discovered that Billings was an officer on whom he could count, a self-starter who needed little direction or supervision. Other senior officers similarly marked his resourcefulness, self-assurance, and confidence. They also found him to be a dedicated and loyal officer, willing to take on any task, unsparing of himself. Some of the junior officers tended to resent him as an inevitable rival for promotions or as someone who tended to be invariably right about things. At the same time, still other junior officers were comfortable with his confident manner, competence, and projects for self-improvement, and became warm friends with him. Perfectionist that he clearly was, he could also be a charming companion for those who understood him and matched his tastes. And those who became his closest intimates might be invited to share one of his small-scale private pleasures; talks about good books or research instruments, celebratory events marked by drinks and cigars; occasional dinners at home with his wife and a few friends.

² Thomas McParlin, "Report of the Medical Director . . . January 14 to July 31, 1864," 11/28/1864, reprinted in *The Medical and Surgical History of the Civil War*, Vol. II (Wilmington, N.C.: Bradfoot, 1990), pp. 148-178.

At the end of the Civil War the War Department recognized his various wartime services by brevetting Billings to the ranks of Captain, Major, and Lieutenant Colonel. And a year later, in 1866, his permanent rank was raised to Captain. Subsequent promotions, however, proved to be as slow in coming for him as for the rest of the regular officer corps, which then fluctuated between 150 and 200 or so surgeons nationwide.

Billings reported for his new duties in the Surgeon-General's Office the first week of January 1865. In assuming this position, he became one of the Medical Department's most envied officers, for senior staff assignments seldom opened up. As early as 1863, he had wondered if he had any realistic chance of ever reaching and entering that "Elysium."³ Actual achievement of the goal meant various things to the fortunate career medical officers who were chosen. It represented an opportunity to work at the center of military medical power, and in some cases it enhanced an individual's chances for eventual personal advancement. In addition, it offered opportunities for studying and doing research in the medical sciences. In Billings's case, acceptance meant giving up further thoughts of a career in surgery or medical practice in favor of gaining an option to do scientific research as well as managing medical and public health activities. The Medical Department in 1865, and for some time to come, remained one of the few American medical enterprises large and complex enough to offer career opportunities to investigators as well as administrators.⁴

For Billings, the new appointment also brought the opportunity to work closely with the Surgeon General himself, a man about whom he already knew much that was favorable. In 1865, Joseph K. Barnes was a large and impressively bearded man of forty-seven. At the beginning of the Civil War he had been a career medical officer with over twenty years of experience in the Medical Department. Some two years later, at the height

³ Garrison, *Billings*, p. 46.

⁴ For general histories of the Army Medical Department, see Mary C. Gillett, *The Army Medical Department, 1818-1865* (Washington: Center of Military History, 1987); Mary C. Gillett, *The Army Medical Department, 1865-1917* (Washington: Center of Military History, 1995); James M. Phalen, *Chiefs of the Medical Department, United States Army, 1775-1940* (Washington: Army Medical Library, 1940); and, for the medical museum, Robert S. Henry, *The Armed Forces Institute of Pathology: Its First Century, 1862-1962* (Washington: Office of the Surgeon General, Department of the Army, 1964).

of the conflict, he became acting Surgeon-General to succeed the able but hot-tempered and controversial William A. Hammond, and in August 1864 he was formally named to the post. Through the remainder of the war, Barnes demonstrated competence in running the Department, displayed flexibility and even-handedness in his leadership style, continued many of Hammond's innovations, and, most important, put the Department on a solid basis through his excellent relations with the Secretary of War, Edwin M. Stanton. Fortunately for the Department, he was able to remain as Surgeon-General for seventeen years after the Civil War, until 1882, when he was retired for age. During that period the professional staff of the Surgeon-General's Office found him to be supportive, firm without being oppressive, a superior who allowed his lieutenants to exercise much independent judgment. For Billings, Barnes also went on to become a primary role model as an administrator, one who exerted a greater influence on his career than any other single person, one who opened the way to incredible opportunities, and one whom the younger man regarded with much respect.⁵

Notable among individuals already on Barnes's staff when Billings arrived were three other career medical officers, each of whom remained in the office another fifteen or more years, dividing the principal administrative tasks with Billings and with him forming a productive if sometimes argumentative team. Charles H. Crane was a career military surgeon whose successive army appointments since 1847 included much administrative experience and, in the middle of the war, earned him appointment as Barnes's principal assistant and then as his deputy. In turn, George A. Otis had brought to the office the intellectual advantage of a year's medical study in Paris, together with civilian experience during the 1850s in private medical practice and as a medical editor; he had begun medical service in the Union army in 1861. The other member of this central body, Joseph J. Woodward, was appointed to the Surgeon-General's staff in 1862 on the basis of experience in academic surgery as well as of his competence in microscopy and pathology; his early military duties had included the writing of official texts on camp diseases and on hospital management.

Working sometimes separately and sometimes together during the war and then on postwar projects, these men of different talents and personalities were united by Barnes's leadership and his confidence in their abilities. In

⁵ There has been next to no historical attention given to Barnes or his work. For a short review, see Mary C. Gillett, "Joseph K. Barnes," *American National Biography* (New York: Oxford University Press, 1999), Vol. 2, pp. 193-194.

turn, they seem to have brought to their service in the Surgeon-General's Office a fierce loyalty to Barnes and the Army, an unsparing work ethic, and a powerful commitment to the improvement both of the Department and of medicine. From time to time other army surgeons appeared for assignments in the Office. While most of these remained only for short periods, Billings established lasting friendships with several of them, particularly Edward Curtis and Alfred A. Woodhull. Neither he nor the others were friendly with the over-pushy and ambitious senior surgeon Jedidiah Baxter, who was attached to the office for administrative reasons beginning in the 1870s.⁶ But it was the long-term team of four whose cumulative work counted most in support of Barnes's efforts to maintain and update America's postwar military medical establishment. And as such they were the ones most responsible for helping him to shape the Surgeon-General's Office into a uniquely influential American center of medical and public health activity during the immediate post-Civil War decades.

Billings's earliest tasks for the Surgeon General included several familiar kinds of upper level office work, including assisting in the preparation and followup of Barnes's orders and correspondence. However, virtually from the beginning Barnes began assigning him to special projects which gave him considerable administrative responsibility and independence. He also encouraged him to leave time for research. The overarching task facing Barnes and his staff in mid-1865 was the organizing and disposing of various medical loose ends of the Civil War even while starting to get on with the challenges of the present. The task had three large elements. One was to carry out the downsizing of the wartime Medical Department. Another consisted of ensuring the effective redeployment and servicing of the Department's remaining medical forces and services that were to be attached to troop units country-wide. The third involved the continued development and management within the Surgeon-General's Office itself of a number of scientific, editorial, and administrative projects and services. Barnes eventually gave Billings assignments in each of these three areas. As they unfolded, the assignments in time provided Billings with a rich base of experience and knowledge for the launching and management of even larger public health and medical institutions nationwide. They also provided him with opportunities for identifying and undertaking research in a range of sciences.

⁶ Phelan, *op.cit.*, pp. 62-65.

Downsizing the Civil War Army's Medical Department

Billings's first substantial administrative assignment was to settle the financial accounts of the War Department's numerous excess civilian contract surgeons who were being demobilized. This was a task that he carried out mainly in Washington. To handle it, Barnes gave Billings a force of clerks and found room for the unit in the Surgeon-General's headquarters building. This was a rented structure across Pennsylvania Avenue from the United States Treasury, about as close to the geographical center of national power as one could get. There Billings worked intensively on this assignment for about two years and then on other assignments for another eighteen years, after which his offices were moved a few blocks away.

Billings's role with the contract surgeons involved supervising the detailed processing of forms and records, the satisfying of the requirements of legislators and auditors. He and his clerks worked with the contents of bulky bundles of official records shipped in from all over the United States. Their specific labors included verification of the details of each individual surgeon's contract; sorting through affidavits of work actually performed; searching for certifications of payments made or due; spotting and correcting mistakes of spelling or arithmetic, and so on. All this was tedious and anything but heroic, but Billings seems to have been comfortable as well as competent in the work. Between January and June of 1865, his unit processed some 3500 such accounts, and in the following year they completed another 1700 or so, but by 1867 this type of work tapered off to no more than a handful of accounts per year.

The second and far larger of the downsizing assignments was that of managing the final disposal of the Department's great wartime general hospitals. Within six months after the end of the war, virtually all of those institutions (there had been 193 in January 1865) had been emptied of patients, but the physical and administrative closure took longer. Initially, the winding up of the hospitals' fiscal accounts had to be done. Increasingly, however, Billings's unit had also to handle the disposition of the reusable or surplus hospital equipment, medical stores, and other property. The carrying out of these tasks again required close clerical scrutiny. It also involved extended correspondence, often with a variety of the former commanding officers, supply clerks, and others who had had property accountability at the hospitals.

To get these things done, Barnes invested Billings with considerable special authority at various times during the 1860s and early '70s to act for

him in supervising or coordinating the medical supply system and disbursing activities. This included his filling in as acting Chief Medical Purveyor during extended periods when that official was absent. An important specific function was to direct the Department's medical purveyors in inventorying and sorting the salvageable property of each of the general hospitals that were being closed in the latters' respective districts. And when that was done, he made arrangements for disposition of the property, often by transfer from one medical depot to another. In addition, some of the property was turned over to the Army's Quartermaster Corps, while much was sold at auction. Numerous auctions were held from the winter of 1865 through the end of June 1866, while even up into the 1870s the purveyors continued to hold such events periodically in order to dispose of their surpluses.

Billings and his unit also exerted financial control over the substantial funds that were realized from these sales. While the major portion was turned over to the Treasury, a certain amount was retained for Departmental operations. Billings managed both the accessions to and the disbursements from this account in the Surgeon-General's office. At the same time, acting for Barnes, Billings maintained central inventory scrutiny over the surplus items that the Medical Department retained at the respective medical depots for current or future use. This required extended discussion and correspondence with the Chief Medical Purveyor in New York, when there was one, but also with the other purveyors, those who had charge of medical depots in St. Louis, San Francisco, Philadelphia, and New York, depots that were retained after the war.

Billings's role in the procurement of certain types of new equipment was of much importance for the Department's other medical officers. Close scrutiny of such transactions was imperative due to the Department's persistent fiscal precariousness, a situation brought on by continued Congressional slashing of Army budgets and exacerbated by the nation's economic depression of the early 1870s. Billings gained recognition for the thoroughness of his control, but he proved to be flexible when it was possible. He was likewise a hard bargainer who made every effort to obtain high value and low prices for the government from suppliers, particularly of such items as drugs, instruments and other equipment, and medical books. To this end, he studied the merchants' catalogs and manufacturers' samples with care and solicited opinions of products from colleagues and friends. When considering the purchase of medicinal liquors or wines, for instance, he commonly wrote both to the medical purveyors and to surgeons at field posts for advice as to taste and quality.

Special requests of the Department's surgeons for personal books or items of professional equipment often required extra handling. Processing of requests for instruments involved Billings in extended correspondence both with the surgeon and the manufacturer or dealer if some unusual feature was needed. More than once, such negotiations left one or more of the parties testy and offended. As one irritated field surgeon put his particular complaint to Billings, "I will not bother your office with another special requisition . . . unless [it] would be granted *without any sense of annoyance*."⁷

In addition to such personal requests, colleagues frequently suggested to Billings that a particular textbook or instrument be ordered in bulk for distribution to some or all of the Department's surgeons or be made available as a standard item on the official supply table. For many years Billings remained actively involved in the process of making decisions about such requests. And such decisions were not made lightly, for Departmental approval of medical textbooks, for instance, could result in orders of several hundred copies of a title to any given printer or dealer, sales which were obviously much sought-after.

As an administrator, Billings quickly proved himself to be efficient, expeditious, and even-handed in performing the various downsizing and supply functions. He also apparently carried them out with few if any complaints on his part. Contrary to some of his biographers, in fact, he not only was comfortable with such chores but welcomed the challenges they presented. As such, he was undoubtedly a joy to his superiors, Barnes and Crane, who thus became the readier to give him even larger and tougher assignments.

The early tasks likewise provided Billings with opportunities to become familiar with most of the Medical Department's operations. Through them he came to know virtually all of the Department's medical professionals around the country, as well as a significant proportion of the nation's civilian suppliers of medical instruments, equipment, and books. Also, remarkably soon, these varied contacts proved of value in facilitating Billings's intimate involvement in what became two of the Surgeon-General's Office's most innovative and important postwar activities.⁸ One of them was the

⁷ Warren Webster to JSB, 3/21/1871, JSB papers NLM.

⁸ I have reconstructed Billings's activities regarding downsizing and supply matters from an examination of his manuscript official correspondence for the period with army personnel, JSB papers NLM.

resumption of his pursuit of medical science through microscopy; the other was the buildup of a medical library that could stimulate and support medical reform and research.

The Pursuit of Science and the Microscope

Among the activities of the Surgeon-General's Office that Billings and Barnes had managed to exempt from downsizing or worse were the two large interlocking scientific projects that had been begun during the war by then Surgeon-General Hammond and which Barnes had pledged to continue. One of these was the day-to-day buildup and operation of the Army Medical Museum. The other was the preparation, utilizing the Medical Department's enormous store of wartime records and artifacts, of a comprehensive analysis and history of all medical and surgical aspects of the Civil War.⁹

In the Museum, Billings's colleagues, Woodward and Otis, for considerable time divided the responsibility for the ongoing collecting of pathological and surgical specimens from the war, their sorting and processing, their extended scientific study, and their public display. Woodward had charge of the medical objects and Otis the surgical, and usually they had one or more junior medical officers helping them. At the same time, they also jointly supervised the technicians and clerks who were gathering and sorting material, preparing photographs and charts, and analyzing the enormous quantities of information and data that were intended for the publication, sometime in the future, of the great multi-volume history. Contrary to what several of his biographers have suggested, Billings did not play a direct or major part in the preparation of that work, which ultimately was entitled *The Medical and Surgical History of the War of the Rebellion*. However, the editors frequently sought his informal help, while they also incorporated a sizeable number of his wartime case records and reports in their successive published volumes.

In pursuing these projects, Woodward, Otis, and others found that their most essential instrument was the microscope, while sometimes their routine

⁹ For the early history of the medical museum and the medical and surgical history project, see Henry, *op. cit.*, pp. 1-105. See also James H. Cassedy, "Numbering the North's Medical Events: Humanitarianism and Science in Civil War Statistics," *Bull. Hist. Med.*, Vol. 66 (1992), pp. 210-233; and Blustein, *Life of William A. Hammond*, pp. 53-93.

labors led to individual or group research on that instrument. Woodward in particular became engaged in exhaustive studies using ever more powerful microscopes equipped with the finest available objective lenses. As a part of that research, he, together with Edward Curtis, developed photomicrography to a point where it enhanced many of the photographs published in the History and helped Woodward gain professional standing as one of America's leading postwar scientists.¹⁰

Billings obviously at an early date found his way to the workshops of the History and the Museum, where he used every opportunity to become an expert in microscopy. Although he had no responsibilities with either of those two projects, he was interested in how microscopes and other instruments were being used in them. Inevitably he learned a good deal from Woodward, but apparently he made no attempt to work closely with the other man. He found Woodward difficult, as well as being limited in his perception of what the microscope might do for medicine. Nevertheless, during the periods when he was a procurement official, Billings had to work with Woodward and the other scientists in obtaining scientific equipment. As such, he quickly became adept in dickering with optical suppliers for microscopes and other instruments as well as in the testing of those items that were furnished on approval.¹¹ Inevitably he took advantage of this proximity to improve his skills as an operator. And typically, in the late 1860s, after a regular work day, he could be found with Curtis or some other professional at the medical museum, increasing his competence in microscopic observation or testing some new instrument.¹²

Apart from helping supply the microscopes needed by his associates in Washington, Billings became aware that some of his medical colleagues at the Army's field posts were also interested in the instrument. Typical of

¹⁰ For varied treatments of Woodward, see G. L'E Turner, "Dr. J. J. Woodward, Microscopist," *Proceedings of the Royal Microscopical Society*, Vol. 1 (1966), pp. 33-39; Leonard D. Heaton and Joe M. Blumberg, "Lt. Col. Joseph J. Woodward (1833-1884): U. S. Army Pathologist--Researcher--Photomicroscopist," *Milit. Med.*, Vol. 131(1966), pp. 530-538; and Mary C. Gillett, "A Tale of Two Surgeons," *Medical Heritage*, Vol. 1(1985), pp. 404-413.

¹¹ Woodward to JSB, 6/20/1868; and W. H. Walmsley to JSB to JSB, 4/10/1872; both items in JSB papers NLM.

¹² For a series of Billings's early journal notes about these and other professional activities, see Garrison, *Billings*, pp. 142-150.

those surgeons, individuals who were anxious to continue their scientific “studies” even out in the bleaker areas of the west, was Surgeon W. H. Gardner, who in 1868 was stationed at Fort Abercrombie in Dakota Territory. Gardner protested at length that only a “few of the simpler and most common apparatus of the Laboratory [are] furnished to Medical Officers, especially those of us who are so far away from where these things can be obtained.”¹³ Certainly, few of the surgeons could afford to buy their own instruments.

Responding to such complaints, Billings was able, despite the budgetary constraints, to obtain limited supplies of certain new items of scientific apparatus and have them listed in the Medical Department’s supply table, thus making them available to interested surgeons. His most conspicuous success in this was in gaining funds to purchase twenty all-purpose microscopes that were sturdy enough for use along the frontier. In the instructions to his English agent, he ordered ten microscopes at a cost of between 18 and 20 pounds each and ten between 9 and 10 pounds. He explained that they were intended mainly for diagnostic work, but “I also want them [to include] enough accessories to stimulate Medical Officers to use the instruments in general scientific research.”¹⁴

When the instruments arrived from London, Billings promptly had them advertised in the supply table of July 1868. In that document, he informed the interested surgeons that “applications for microscopes will be favorably considered provided the evidences be satisfactory that the officers will use the instruments for the benefit of science.”¹⁵ And, when selections were made, Billings provided for each successful applicant to receive a copy of Lionel Beale’s pamphlet, *How to Work with the Microscope*.¹⁶

Also in the fall of 1868, Billings, by then a proficient microscopist himself, was given a special assignment that utilized those skills. This came about soon after the outbreak of a damaging mid-West epidemic of cattle diseases, one of which was identified as Spanish fever or Texas cattle disease, while the other was pleuropneumonia. Responding to the emergency,

¹³ Gardner to JSB, 7/8/1868, JSB papers NLM.

¹⁴ JSB to R. S. Maddox, undated draft letter (probably 1867), JSB papers NLM.

¹⁵ George S. Rose to JSB, 7/25/1871, JSB papers NLM.

¹⁶ J. K. Barnes, *Instructions for Medical Officers to Whom a Microscope is Furnished* (Washington: Surgeon General’s Office, War Department, 1868).

Horace Capron, the United States Commissioner of Agriculture, engaged the London veterinary surgeon John Gamgee, already in the United States, to make a broad general investigation of the causes, distribution, and character of the diseases together with possible remedies or preventive measures. In addition, Capron turned to the Army to provide experts who would work with Gamgee on the core medical-scientific aspects of the investigation.¹⁷

Billings and Curtis were the officers selected for this highly specific task, to investigate "the question of the possible cryptogamic origin of cattle diseases." Over the next several months, as a necessary preliminary step, the two combed the Washington area for as many species of fungi as they could locate. At the same time, Gamgee, then in Texas, also collected fungi, together with numerous samples of the blood and secretions from diseased cattle as did Army medical officers from the Southwest.¹⁸ They then sent the samples by express to Billings and Curtis in Washington, who carried out a variety of microscopic tests. During the same period, Billings worked out travel arrangements for the South Carolina botanist Henry Ravenel to go to Texas to assist Gamgee in the gathering of fungi.¹⁹

In the late summer of 1869, the two army men informed Capron and Gamgee that their findings were essentially negative. They had discovered no fungi in the samples of blood and secretions and found no other connections between fungi and diseased cattle. Moreover, they concluded that, given the limited current state of knowledge, both of the nature of infectious agents and of microscopic methods, at least for this particular research problem,

¹⁷ Department of Agriculture, *Reports on Diseases of Cattle in the United States* (Washington: G.P.O., 1869).

¹⁸ See, for example, H. McElderry to JSB, 7/16/1869, JSB papers NLM. Curtis himself, posted briefly to Iowa in the middle of the project to photograph a total solar eclipse, sent back a few fungi. Curtis to JSB, 7/11/1869 and 7/25/1869, both in JSB papers NLM. For brief accounts of Curtis, see "Edward Curtis," in Howard A. Kelly and Walter L. Burrage, *Dictionary of American Medical Biography* (Boston: Milford House, 1971), pp. 275-276; and Henry, *Armed Forces Institute*, pp. 36-44, 53.

¹⁹ See Arny R. Childs, ed., *The Private Journal of Henry W. Ravenel, 1859-1887* (Columbia: University of South Carolina Press, 1947), pp. 332-352.

studies using simpler instruments would probably for the near future remain “more efficacious than the microscope and ‘culture apparatus’.”²⁰

Lacking positive findings from Billings and Curtis on the causes of the respective cattle diseases, Gamgee’s final report to the Agriculture Department had relatively little influence, at least as far as suggesting effective public health management was concerned. However, for Billings, the assignment was distinctly positive in nature, at least initially. It introduced him to a research topic that was both fascinating and timely, as well as potentially vast. He followed the project up by writing a few short articles on the minute fungi, particularly for *The American Naturalist*, which brought him many indications of interest and support. Commissioner Capron, moreover, when thanking him for his collaboration, expressed the hope that Billings would be able “to continue [his] researches for the benefit of science.”²¹

This was very much in accordance with Billings’s career wishes at that particular moment. In fact, before he and Curtis had completed even that one initial and limited aspect of the work, they had begun circulating a plan to follow it up with an ambitious collaborative research project aimed at “positively proving or disproving the notion of the causation of disease by fungi or algae.” In the hope of obtaining the “concurrent testimony of great numbers of experiments and observations,” they laid out a plan to enlist numerous physicians around the country as voluntary investigators on the project. Those researchers were to perform standardized microscopic experiments and send their results to the coordinators, Curtis and Billings, at their laboratories in the Surgeon General’s Office. The two army men felt that such an effort would not require researchers who insisted on employing the “highest powers of the microscope,” but only those who were “competent and willing [to use] a good working glass.” And they warned would-be collaborators that the most difficult part of their study would come near the end, when and if they began an actual attempt to prove a possible causative relationship of a fungus with a specific disease. Paraphrasing but adapting Jakob Henle’s classic microbiological challenge, they emphasized that the experimenter “must aim, having found his fungus, to isolate it in the form in which it occurs in or enters the body, and then by administration or

²⁰ J. S. Billings and Edward Curtis, “Report of Results of Examinations of Fluids of Diseased Cattle with Reference to Presence of Cryptogamic Growths,” in Department of Agriculture, *Reports on Diseases of Cattle*, pp. 174-190.

²¹ Horace Capron to JSB, 2/5/1870, JSB papers NLM.

inoculation of it alone, to reproduce the disease in question. Such alone would be a decisive test.”²²

This proposal—at once enthusiastic, astoundingly ambitious, and strikingly original for the American biomedical scene at the time—was made public in 1869 in the transactions of the American Medical Association. The communication provided the specifics of Billings’s hopes for a possible career in microbiology and laboratory research. And it clearly identified Billings both as Curtis’s co-initiator of the proposal and as the intended co-manager and co-leading investigator of what they hoped would be a major research enterprise.²³

Among those replying, a variety of AMA members expressed support for the project. However, it soon became apparent that there were not yet enough available medical men in the United States who had the necessary microscopic skills or equipment. And, even more damaging, at some point in the early or mid-1870s, support for the project was discontinued in the Surgeon General’s Office, apparently for other reasons. It is likely that the Medical Department could not afford a project of this size, while in addition Barnes, for a change, may have been unwilling for Billings to take on another complex and long-continuing undertaking, particularly one that might well jeopardize the continued buildup of the Surgeon General’s library. Moreover, the proposal may well have also been actively disputed by Woodward, who had already shown himself to be a fierce opponent of anything at all related to the germ theory of disease causation.²⁴

This decision permanently crushed what hopes Billings had of contributing significantly as a laboratory investigator to the period’s epic scientific effort to unravel the unknowns associated with microscopic organisms, their nature, and their relationships to both human and animal

²² Edward Curtis, “Cryptogamic Origin of Disease, With Special Reference to Recent Microscopic Investigations on that Subject,” *Trans. of A.M.A.*, Vol. 20 (1869), pp. 469-472. Henle had outlined his postulates in his *Pathologische Untersuchungen* of 1840, while Robert Koch’s more explicit postulates were not published until 1878 in his *Untersuchungen über die Aetiologie der Wundinfectionskrankheiten*.

²³ Curtis, “Cryptogamic Origin,” *loc. cit.*, pp. 467-472.

²⁴ See, for instance, Mary C. Gillett, *Army Medical Department 1865-1917*, pp. 28-31. For Woodward’s etiological views, see Gillett, “Tale of Two Surgeons,” *loc. cit.*, *passim*.

diseases.²⁵ It did not, however, diminish his interest in science or his readiness to spur its applications to American medicine and public health. Moreover, he had already committed himself to the development of another, totally different type of resource under the umbrella of the Surgeon-General's office.

Beginnings of the Surgeon-General's Medical Library and Other Initiatives

The launching of the medical museum and the medical and surgical history project during the Civil War were of course not intended to be of use while the fighting was going on but to stimulate long-term improvements in the quality of American army medicine. Another part of that plan had projected the creation of an army medical school, but that failed to gain approval until 1893. However, the concept of a fourth unit, a medical library, though not originally projected, began to be bruited around by Barnes's staffers around the end of the war.

When Billings joined Barnes's staff, he found that various of the staff officers, in the pursuit of their duties, were occasionally ordering professional books and journals to add to the existing small office collection of something over 2,000 volumes. Over the next few years, as he carried on other procurement activities, most of this literature acquisition activity was informally turned over to him, to his evident satisfaction. Sometime in 1867 Barnes gave Billings formal responsibility for managing the collection and its use, and by 1870 he had given him both the authority and some funds to proceed with a systematic if initially slow expansion and development into an actual library.

The importance of the library to the personnel of the Medical Department was evident from its beginning. Its journals and monographs became ever more essential working tools not only for Barnes but for the scholarly compilers of the Medical and Surgical History, the scientists in the museum, and not least, for Billings himself. They also became increasingly available and useful to the Department's field surgeons, a significant number of whom had their own specialties or scientific interests. Ultimately a number of those surgeons were able to cooperate in Billings's country-wide searches for hard-to-find journals and in other library tasks.

²⁵ Two decades or so later, however, Billings's name appeared as sponsor in a few instances on the reports of laboratory investigations conducted by younger scientist colleagues.

Reflecting the original mission of the Medical Department, the early purchases for the Surgeon General's Library were largely confined to textbooks and journals that dealt with sanitation, epidemiology, vital statistics, hygiene, field hospitals, and other aspects of military medicine. However, beginning in the early 1870s, Billings began to expand those collections rapidly and in many directions.²⁶

In 1867, several of the appendages of the Surgeon-General's Office—among them the medical museum, the history project, the budding library, and the voluminous Civil War medical records, along with some of the staff members—were moved a few blocks into a recently renovated building that had become a Washington landmark. This was the former Ford's Theatre, notorious as the site of Abraham Lincoln's assassination in April 1865. The symbolism of moving these particular functions into a structure that was so highly charged with national emotions and memories cannot have been lost upon the Medical Department's employees. But, the pressures of their postwar jobs left them little time to dwell upon that coincidence.

After Billings's downsizing responsibilities ended, and despite his work in the Library, the Surgeon-General occasionally turned other large Medical Department projects over to him, including that of conducting a major health survey of the Army's numerous field posts. In addition to such internal projects, moreover, Barnes and other Surgeons-General over the years agreed to a series of extended loans of Billings's part-time scientific services, both to other federal agencies and to private institutions. Between 1869 and 1872 alone, he made the latter available for assignments of several months each to the Department of Agriculture, the Treasury Department, and the ninth census. And later, in the seventies and eighties, Billings was loaned out for a number of largely scientific tasks, each of which stretched out for several years. Of particular significance were his assignments to various congressional committees, the trustees of the Johns Hopkins Hospital, the Johns Hopkins Medical School, the National Board of Health, the tenth and eleventh censuses, and the University of Pennsylvania. I will expand at length on those assignments in later chapters.

²⁶ I examine the growth and influence of the library in its later broader Army framework in my chapter 4. For its detailed history until the mid-twentieth century, see Wyndham B. Miles, *A History of the National Library of Medicine* (Bethesda, Md.: National Library of Medicine, 1982), pp.1-183.

Army officials, taking into account only his considerable contributions to the government, in 1876 promoted Billings to the permanent ranks of Major and Surgeon. In 1883, with the death of Otis and terminal illness of Woodward, they gave him further recognition and responsibility by making him director of a new division of the Surgeon-General's Office, one that incorporated the medical museum as well as the library. He remained in that capacity until retirement, though there were several attempts during these years, by supporters both in and out of the Army, to obtain his appointment as Surgeon General. In professional and scientific circles, Billings was seen not only as being far better qualified than any of the medical officers who occupied that post in succession between Barnes's 1882 retirement and the selection of George Sternberg in 1893, but as playing far more important roles in American medicine than any of them. The truth of it was, in fact, that he was far better known, wielded far greater influence in Congress and elsewhere, and was far more fully informed of the Army's work than any other candidate. Nevertheless, all of the attempts on his behalf failed, mainly due to his lack of sufficient seniority. However, he was promoted one final time, shortly before his retirement in 1895, to the grades of Lieutenant Colonel and Deputy Surgeon-General.

In making his loan arrangements, Billings made certain not to be away from Washington more than a very few days at a time. This made it possible for him to perform the bulk of the extra tasks at his own desk. It was important for him to remain close to Washington most of the time, first of all because the Army required it, but also because he liked the varied activity of the city. Besides, as long as he was in the running to become Surgeon General, he had to stay in close touch with key federal politicians and Army brass. Only in the 1890s, as his children grew up and began to move away, did he drop his candidacy for that top position in the Medical Department. And only then did he begin to seriously consider giving up his activities in medicine and science or moving to some site outside Washington and the Army.

At Home in Postwar Washington

Throughout most of his army and professional careers, Billings also had family responsibilities. In the fall of 1861, soon after coming to Washington to take the examinations for his Army commission, he met Katherine Stevens, the daughter of a retired lawyer and one-time Michigan congressman who lived in Georgetown, adjoining Washington. For much

of 1862 Billings and Kate courted during whatever intervals they could find between the former's hectic surgical stints in the local army hospitals. In September, faced with his imminent transfer to a Philadelphia army hospital, the couple were married at St. John's Episcopal Church in Georgetown. Subsequently, Kate sometimes joined her husband when he was on duty in Philadelphia and later in New York. However, during much of his war service she was back at the Georgetown family home on Congress Street. Billings joined her there for short periods during the war, at least twice to recuperate from stress or other illness, and they remained in that house and another temporary residence for several years after the war. Their first child, a girl, was born in 1863, while over the following nine years they had three more girls and a boy.

During the early postwar period, the city of Georgetown held mixed attractions as a place in which to live. Still important as a Potomac river port, the community included a lively area of docks, warehouses, stables, and the like. Not far away from those, there was a commercial area that included numerous shops, some offering products of good quality. It also had three hotels that catered, among other clients, to travellers on the Chesapeake and Ohio Canal. Close to both of those areas were the small houses of tradespersons, servants, and the poor, while a bit further off, up the hill, were the fine large houses and gardens of the well-to-do. Many of the Georgetown streets, including principal routes that led out of town, were chronically muddy, rutted, or dusty, as well as infested with dogs and sometimes clogged with livestock being driven to market. In addition to its white middle class majority, the population included a mix of some poor whites, two or three thousand blacks, and, for the moment, a lingering white elite that was strongly Southern and anti-black in its sentiments. Politically, as Mary Mitchell and other historians agree, the town was predominantly conservative and Democratic, and it resisted incorporation of its government with that of Washington as long as possible, i.e. until a Congressionally-imposed merger took effect in the 1870s.²⁷

²⁷ This paragraph owes much to Mary Mitchell, *Chronicles of Georgetown Life 1865-1900* (Cabin John, MD., and Washington, D.C.: Seven Locks Press, 1986); and, in broader ways, to the work of Constance McLaughlin Green, *Washington: A History of the Capital, 1800-1950*, 2 vols.in 1 (Princeton: Princeton University Press, 1976).

While their family was growing, Billings and Kate had little time or money for a social life, either within or outside the home. In any case, Billings was nearly always more inclined to spend any spare time at self-improvement than at "social" affairs *per se*. Soon after beginning work in the Surgeon-General's Office, he formed the habit of borrowing books on all kinds of subjects from the Library of Congress. Frequently, during the '60s, he and other staff officers, especially Curtis and Woodhull, got together after work to discuss their reading. At other times Billings worked late at the museum with them on some experiment or other. And sometimes, as Garrison relates, he took portions of dog, mouse, or other animal cadavers home, where he practiced dissections or other procedures before breakfast.

From time to time, Garrison also reported, Billings had dinner in town with one or more of his colleagues. Occasionally he went to their homes for cards, smoking, and often good conversation. However, when some of them went to Woodward's, it generally seemed to be the host who "smoked and talked," while the rest were reduced to smoking and listening.

During the early 1870s, Billings and his family found their lives directly affected by local social change and politics. The District of Columbia's new territorial government, now with jurisdiction over both Washington and Georgetown and under the ruthlessly energetic leadership of "Boss" Alexander Shepherd, launched a massive program of public works. By 1874 the pursuit of this work had reduced the government to total bankruptcy and had forced Shepherd from office. However, in the process, the previously unprepossessing and sometimes squalid physical topography of large portions of the capital city, including Georgetown, had begun to be transformed. And with it, concrete evidences of the modern "sanitized" metropolis began to appear with the newly paved streets, sidewalks, parks, gas lights, and extended water, drainage and sewerage systems.

At just this time, Billings and Kate, together with the latter's sister and her husband, Oscar Stevens, decided to build adjoining twin houses in Georgetown to accommodate their increasing families. Begun in the fall or winter of 1872, the houses were completed in the spring of the next year. The families moved in immediately, though only to have to put up with the noisy and lengthy disruption caused by the coming of Shepherd's sewer, water main, and paving construction to their block of Gay Street (later renamed N Street) soon afterward. Once the public works were completed, however, Gay Street and adjoining streets fairly rapidly became attractive, convenient, and congenial addresses for the growing numbers of professionals, army

officers, scientists, and middle-level bureaucrats who began moving into Georgetown.²⁸

In their new house, the Billingses, like many other career army couples, worked long and hard to raise their children decently on a meager salary.²⁹ They appear to have succeeded over the long run, but it was at a cost. For Billings himself, it was not a great sacrifice to do without most luxury items, and he got along throughout the entire period without owning horses and carriage. He liked cigars, and he took an occasional glass of whisky, but his single major indulgence in the new house seems to have been having a separate library room. As things turned out, the library seemed to have been rarely used for pleasurable or reflective reading, either by Billings or any other family member. Rather, it early became a room in which Billings closed himself up night after night away from the rest of the family to do work that he brought home from the office. Rosenberg has documented the permanent anguish that this compulsive pursuit of the work ethic inflicted on Billings's son, while Chapman and other authors have suggested the probability of there having been even broader "ugly vistas of stress" in the relationships of the entire immediate Billings household.³⁰ At least, given the demands of the situation, some such family arrangements and problems seem to have been prices that Billings elected to pay in exchange for success in his professional and public life.

In this, of course, Billings differed little from many other men of his generation. In other respects, however, he stood out. His intimates, for instance, saw him as a husband with a deep love for his wife, a person who

²⁸ See account in Mitchell, *Chronicles*, passim. Billings and Stevens seem to have jointly drawn up the plans for the houses. During the 1870s and early '80s, they also were among several partners in the Washington Chemical Works, a venture which ended badly for all. Billings ultimately admitted to having had losses of over \$5,000, while Stevens was said to have been completely ruined. JSB to E. L. Dubarry, 5/4/1885, JSB papers NLM.

²⁹ For a glimpse into some of the family's modest patterns of consumption, see "Household Account Book, 1874-1882," JSB papers NYPL. See also Mitchell, *Chronicle*, p. 97, for a note on the involvement of Billings and his daughters in the Georgetown Assembly, where the social graces were taught.

³⁰ Charles E. Rosenberg, "Making it in Urban Medicine: A Career in the Age of Scientific Medicine," *Bull. Hist. Med.*, Vol. 64 (1990), p. 185. Chapman, *Order Out of Chaos*, pp. 333-335.

was highly loyal to family and friends as well as to supervisors and professional associates. His friends were also sometimes treated to his humor. However, it remained that, with his relentless work ethic, he was not always easy either to live or work with. He expected others to live up to his own high standards and did not suffer laggards or fools gladly.

Throughout his army career as well as in his involvements with other branches of government, academia, and the professions, Billings demonstrated high levels of focus and drive. It was also widely agreed that he cut an impressive figure. Possessed of a commanding physical appearance, a supreme self-confidence, and an awesome command of facts, he had an extraordinary presence as a leader. He was persuasive as a speaker, disciplined and self controlled almost always. He rarely displayed anger, discomfort, or pain. Not a religious man, Billings respected the beliefs of others. However, he was a veritable bulldog in pursuing his personal mission for the betterment of medicine and science. He also impressed his contemporaries with his ability to bridge the worlds of practical affairs and action with those of books and knowledge.³¹

Billings's resignation from the Army in 1895 marked the approaching end of his long period as an investigator and administrator in public health, medicine, and science, though he resumed science administration a few years later. He did not leave the army until after his children had reached adulthood and also not until he had carried out his objectives for the Surgeon-General and his Library as well as his commitments to other Washington agencies. I summarize his post-1895 activities briefly in an Epilogue.

³¹ More extensive assessments of Billings as a person can be found in Garrison, *Billings*, and Chapman, *Order Out of Chaos*, and see also the numerous obituaries, many of which are cited in Frank B. Rogers, comp., *Selected Papers of John Shaw Billings* (Baltimore: Medical Library Association, 1965), pp. 11-13.

Chapter 2

Hygiene in the Postwar Army

By the end of 1866 Billings had substantially completed the downsizing of the Medical Department, but he did not yet have official clearance to go ahead with the library project. Actually, Barnes badly needed his help at just that time for another large project, charting the peacetime course of another of the Department's major responsibilities. Specifically, new information had to be gathered pertaining to the Army's arrangements for the medical care of the troops, now including those serving in the area of the former Confederacy as well as those in previous Union areas and in the vast territories of the West. As a result, over the next several years, Billings was managing a large fact-finding inquiry of the Department's field activities in both public health and curative medicine, and in the process extended his inquiry much further than Barnes had in mind. His subsequent reports on his findings were, in fact, useful both to the postwar Army's commanders and surgeons as well as to civilian physicians and sanitarians.

Preventive Medicine as an Army Concern

American Army medicine had traditionally consisted mainly in whatever curative measures and facilities the Medical Department had available for the sick or wounded soldiers, and those services in themselves needed constant attention and improvement. But Barnes, like Hammond, was one of those nineteenth century army medics who were convinced that curative medicine needed to be significantly supplemented by preventive medicine and hygiene. Further preventive measures, if carried out energetically, could conceivably allow Departmental budgets to go further. They might also offset some of the painful effects on the Department of downsizing, declining congressional appropriations, and numerous postwar resignations of career medical officers.

Prior to the Civil War, the individual post or field surgeons of the American Army's Medical Department were responsible for hygienic measures only to a limited extent. Such surgeons had periodically vaccinated the troops in their units, and since 1819 they had kept standard records of diseases, deaths, and weather conditions, all of which were regularly reported to the Surgeon General. For the most part, however, it was only during epidemics or other sickly periods that they gave much attention to environmental conditions, contaminations of food and drink, inadequate clothing or bedding, ventilation of housing, or even to provisions for camp drainage and the disposal of human and animal wastes. Exacerbating this was the fact that medical advice offered by the army surgeons to their post commanders on these matters seems often to have been disregarded. Moreover, long established policy had placed the responsibility for some aspects of sanitation outside the Medical Department, particularly in the Quartermaster's Department.

Whatever the reason, apart from an occasional individual surgeon stationed at posts in or near large cities, the antebellum Army Medical Department seems to have shown no awareness of and taken no official role in America's public health movement. In fact, even the national quarantine and sanitary conventions that were held between 1857 and 1860 failed to obtain the participation of the Surgeon General or anyone from his office, either as delegate or participant. The Civil War, however, made possible the emergence of a large new appreciation of prevention within the Medical Department. Much of this resulted from the crusading impact of the civilians who made up the United States Sanitary Commission. Those individuals were considerably motivated by the example of Florence Nightingale and the information she had helped disseminate about the high rate of mortality of the British military forces in the Crimean War from rampant disease, a catastrophe that was widely attributed to gross unsanitary conditions. In an effort to prevent such a disaster in the United States, they persuaded some of the Union officials to accept their offer of sanitary advice, medical supplies, and humane services for the troops, and they ultimately got the Department to institute hygienic improvements in camp sanitation, hospital design, individual cleanliness and the like throughout the armies. Most important, probably, the Commission early in the war obtained the selection of William A. Hammond as the new Surgeon General. Despite his relatively short time in that post (one and a half years), Hammond had considerable success in implementing these sanitary measures even as he

organized the medical museum, planned the medical and surgical history, and initiated other changes.¹

Hammond also found time to write a primer on military medicine. In this 1863 work, his *Treatise on Hygiene*, he summarized current hygienic knowledge and health care methods for troops, particularly practices in the British, French, German, and other European armies. He also described preventive and sanitary procedures that he had already begun introducing in hospitals, barracks, and elsewhere in the Union's wartime Medical Department, and which Barnes went on to continue. This text was a work that Billings and the other career medical officers and contract surgeons had been expected to read and follow as far as was feasible under battle conditions. With it, America's large wartime military medical establishment went some distance toward endorsing and adopting the philosophy of military sanitation and preventive medicine that had taken root in England and on the European continent during the decades since John Pringle and since later hygienists of the Napoleonic era. However, after the ending of the war, it still remained for those principles to take widespread permanent hold in the peacetime army of the United States. Moreover, American military surgeons in any significant number, particularly those at the top, had yet to form effective links with the civilian leaders and institutions of

¹ See Blustein, *Life of William A. Hammond*, pp 53-93. Among useful general works, see Mary C. Gillett, *The Army Medical Department, 1818-1865* (Washington: Center of Military History, U. S. Army, 1987); Mary C. Gillett, *The Army Medical Department, 1865-1917* (Washington: Center of Military History, U. S. Army, 1995); P. M. Ashburn, *A History of the Medical Department of the United States Army* (Boston: Houghton Mifflin, 1929); and Stanhope Bayne-Jones, *The Evolution of Preventive Medicine in the United States Army, 1607-1939* (Washington: G.P.O., 1968). For the Civil War, see Charles J. Stille, *History of the United States Sanitary Commission* (Philadelphia: Lippincott, 1866); William Q. Maxwell, *Lincoln's Fifth Wheel: The Political History of the United States Sanitary Commission* (New York: Longman's Green, 1956); and James H. Cassedy, "Numbering the North's Medical Events: Humanitarianism and Science in Civil War Statistics," *Bull. Hist. Med.*, Vol. 66 (1992), pp. 210-233. For public health, see John Duffy, *The Sanitarians: A History of American Public Health* (Urbana: University of Illinois Press, 1990); and Wilson G. Smillie, *Public Health: Its Promise for the Future* (New York: Macmillan, 1955).

the country's public health movement.² Billings, as it turned out, quickly assumed considerable leadership, both scientific and administrative, of that civilian movement even as he was helping to solidify the Army's interest in preventive medicine.

Sanitation of the Army Posts: A National Survey

In 1867 Barnes began the process of extending the sanitary and hygienic practices of the Civil War armies to the numerous but mostly smaller field installations of the postwar army. He initially assigned Billings to look through the office files of reports from field medical officers for information about existing preventive practices. When very little turned up, he assigned Billings, very likely on the latter's suggestion, to design and carry out what became in effect a comprehensive two-part survey of the situation, to suggest changes, and to edit and organize the collected material for publication. This survey, which Billings conducted principally in Washington from his desk in the Pennsylvania Avenue building, occupied large amounts of his time for the next seven years.³

Some officers of the post-Civil War Army, of course, already had experience in or were newly involved in various kinds of surveys and other information-gathering enterprises, particularly in the West. Army engineers

² William A. Hammond, *A Treatise on Hygiene, with Special Reference to the Military Service* (Philadelphia: Lippincott, 1863). At the end of the war, Frank H. Hamilton dealt with the same subject in his *A Treatise on Military Surgery and Hygiene* (New York: Bailliere, 1865). A number of antebellum America's civilian physicians and reformers had been interested in both personal and public hygiene, and several, among them John Bell, John Griscom, and Edward Jarvis, wrote on the subject. See discussion in James H. Cassedy, *American Medicine and Statistical Thinking, 1800-1860* (Cambridge, Mass.: Harvard University Press, 1984), pp. 103-119.

³ Billings's biographers have touched only superficially if at all upon this project. For example, see Chapman, *Order out of Chaos*, pp. 83-85. My account of the survey is based largely on the two large reports by Billings: *A Report on Barracks and Hospitals, with Descriptions of Military Posts*, Circular No. 4, U.S. Surgeon-General's Office (Washington: G.P.O., 1870); and *A Report on the Hygiene of the United States Army, with Descriptions of Military Posts*, Circular No. 8, U.S. Surgeon-General's Office (Washington: G.P.O., 1875).

above all were in much demand to participate in official explorations and mapping expeditions, in the surveying of railway routes, and sometimes to support geological surveys and other scientific ventures. Moreover, surveys of army health were by means unknown in the Medical Department.

To a certain extent, Barnes and Billings seem to have liked the idea of the survey as a means of providing general orientation material for medical officers going to new posts. They also viewed it as a means for the headquarters staff to improve its controls over the Department's medical field operations around the United States. It was likewise thought of as a potential contribution to medical science and, as such, as a direct successor to three earlier Army health inquiries. Mandated by Surgeon-General Thomas Lawson, the first of those previous surveys had been conducted in 1840 by Samuel Forry and the others in 1856 and 1860 by Richard H. Coolidge.⁴ Like those antebellum undertakings, the bulk of the material intended for inclusion in the new survey was to come from narrative, statistical, or other descriptions supplied by surgeons at the various army posts.

Billings, as editor, however, was left free to expand or otherwise modify the post accounts as desired, as well as to comment upon their general significance.

In the process his survey differed importantly from the earlier surveys in scientific purpose and in content. Forry and Coolidge had shaped their surveys to satisfy Lawson's desire for exhaustive information on the medical climatology and topography of the posts and, by extension, of the various regions of the United States. They had intended them to shed light on and hopefully confirm some of the presumed relationships between disease and the physical environment through correlations of the posts' vital statistics with their relevant meteorological data. As such, their reports had become

⁴ Samuel Forry, *Statistical Report on the Sickness and Mortality in the Army of the United States . . . from January, 1819, to January, 1839* (Washington: Jacob Gideon, 1840); Richard H. Coolidge, *Statistical Report on the Sickness and Mortality in the Army of the United States . . . from January, 1839 to January, 1855* (Washington: Nicholson, 1855); and Richard H. Coolidge, *Statistical Report on the Sickness and Mortality in the Army of the United States . . . from January, 1855 to January, 1860* (Washington: Bowman, 1860). An excellent study of the findings of those surveys for antebellum Texas posts is James O. Breeden, "Health of Early Texas: The Military Frontier," *Southwestern Hist. Q.*, Vol. LXXX (April 1977), pp. 357-398.

parts of a landmark antebellum scientific study, one which brought the Army Medical Department much credit at the time. However, their material left more medical questions unanswered than they answered. By the Civil War, the army posts' reports on climate, weather, and disease were proving far more useful to agriculture and commerce than they were to epidemiology. By the late 1860s, in fact, the Army had begun planning for a gradual transfer of the entire meteorological operation—the collection of data, reporting, collating, and publication—to the new Signal Office that was being organized elsewhere in the War Department.⁵

Billings therefore had considerable incentive to give a new thrust to his survey, though he did not at once repudiate all of the assumptions of the medical climatologists or topographers. In his basic plan, in fact, he allowed the field surgeons to incorporate in their reports a wide variety of traditional environmental background information about the posts: geographical settings, local flora and fauna, geological features, prevailing climates, and so on, including up-to-date mortality, morbidity, and meteorological data. But such information was no longer enough. Unlike Forry and Coolidge, therefore, Billings did not direct his main focus upon the climatic influences on health but on man-made influences. He based his inquiries less on abstract theories of disease than on specific measures intended to prevent disease. His general objective in the postwar period was still to uncover "facts bearing upon the hygiene of the posts and the sanitary condition of the troops," but the thrust was to be a limited one, the targetting of selected kinds of facts.⁶

To enhance the narrative accounts that were sent in, Billings went to some lengths to obtain in-scale drawings of the physical layouts of as many as possible of the posts, particularly the new ones in the west. Typical of the features that were indicated on these drawings were the posts' barracks, officers' quarters, stables, guard house, hospital, laundresses quarters, storage facilities, and post administrative office. Some also included cisterns or reservoirs, privies, wells, shops, parade grounds, and prominent topographical features, such as streams or hills.

⁵ Edward Erskine Hume, "The Foundation of American Meteorology by the United States Army Medical Department," *Bull. Hist. Med.*, Vol. 8 (1940), pp. 202-238; James H. Cassedy, *Medicine and American Growth, 1800-1860* (Madison: University of Wisconsin Press, 1986), pp. 29-32, 44-50.

⁶ Billings, *Barracks and Hospitals*, p. vi.

Billings carried out his survey in two stages, the first between 1868 and 1870 and the other immediately afterward during the years up to 1875. In each stage he focussed on certain selected problems of military preventive medicine, hardly touching at all upon sanitary matters for which the field surgeons were not then primarily responsible, such as water supply, drainage, and disposal of wastes. For the first stage of the investigation, Billings initially called upon the field surgeons to submit detailed information on the hygienic status of the post barracks and hospitals. He then spent nearly two years obtaining supplementary details on these matters from the posts as well as from the Surgeon-General's Library and other Washington sources, and ultimately in editing the contributions and preparing his own introductory commentary on them.

The reports that reached Billings generally confirmed outsiders' impressions of the Army's field posts as being frequently cramped, often pervaded by the noises and smells of animals, and sometimes filthy as places to live in. But no parts of the posts, he thought, posed as much danger healthwise as the barracks that were provided for enlisted men. From his own experience as well as from the reports, Billings picked out a number of barracks-related deficiencies for particular comment. Among them he briefly noted the frequent inadequacy of bathing facilities, the crude state both of the outdoor latrines and the occasional indoor toilets, and the extensive continued use of double-decked bunks, contrary to medical advice. But he was concerned above all by the presumed threat to health posed by excessive overcrowding and poor ventilation of barracks at many of the posts. As a result, he devoted his introductory essay for the first survey report largely to those dangers.

In formulating his opinions on this matter, Billings drew on some of the best authorities of the day. The Surgeon-General's Library already had some of the relevant works by French, German, and other continental hygienists. But he relied particularly upon the British findings, notably reports on ventilation standards that had been developed by Edmund A. Parkes of Britain's Army Medical School and by a series of British government barracks commissions during the 1860s. Among American investigations, he drew upon some of the early findings of Morrill Wyman, but he gave his conclusions timeliness by commissioning up-to-date chemical tests and air space measurements at barracks on selected American posts.⁷

⁷ Edmund A. Parkes, *A Manual of Practical Hygiene*, 1st. Ed. (London: Churchill, 1864); *Sanitary Report on Barracks and Hospitals* (London: 1861); Great Britain, Barrack and Hospital Improvement Commission, *General Report [on]*

Billings's survey confirmed that overcrowding and poor ventilation were indeed extremely widespread in America's post-Civil War barracks. In brief, out of the 146 active army posts for which reports were submitted during the first phase of the survey, he found that only in 39 did the barracks meet or exceed the minimum of 600 cubic feet of air space per man that had become standard for the British. By the same standard, he deemed the space allowance in 61 other posts "insufficient", while in another 46 it was "decidedly insufficient." All in all, he concluded, the deficiencies clearly suggested an urgent need for hygienic "reform" in the American army, i.e. for improved design and construction of barracks.⁸

While such statistics were compelling, the Army of 1870 had few funds to provide its barracks with better flues, ventilation systems, or stoves, let alone allocating more space per soldier. What money there was for such purposes had to be reserved for those posts that had the most sickness from overcrowding and poor ventilation but which were also strategically and geographically crucial to the Army's current pursuit of the Indian wars. Billings's survey results provided the army with a basis for selecting those posts. And in his 1870 report he outlined some of the reasoning by which these criteria had been applied to the Army's four main types or classes of military posts.⁹ Most forts in the oldest class, he pointed out, the coastal defense installations along the Atlantic and Gulf coasts and the Great Lakes, would ordinarily have demanded attention because of the well-known unhealthfulness of their typically damp and cramped barracks in stone casemates. However, in 1870, many such posts, located far from the areas of current hostilities, were no longer active. Accordingly, having been stripped of all but a few caretaker troops, for the time being they had virtually no claim to priority for sanitary improvement.

Forts of the other three classes, well over half of those reported on, were highly active since they were mostly located in the West, close to or in the

the Sanitary Condition of Barracks and Hospitals (London: H.M. Stationery Office, 1861-1863); Morrill Wyman, *A Practical Treatise on Ventilation* (Boston: Munroe, 1846). Billings also acknowledged the influence of Florence Nightingale and various of her publications, including her *Notes on Hospitals*, 3rd. Ed. (London: Longman's Green, 1863). See Billings, *Barracks and Hospitals*, pp. v-xxxiii.

⁸ *Ibid.*, pp. xiv-xv.

⁹ *Ibid.*, p. xv.

midst of the active fighting against the Indians. This location alone gave them special significance and prominence in both portions of Billings's survey. His second class included depots for recruits and staging sites for the troops that were being moved from the South and East to the West or from one place to another in the West. The records showed that these posts habitually experienced the worst overcrowding and most frequent disease outbreaks and should thus have high priority attention. Fortunately, Billings thought, these conditions could be easily and inexpensively improved, principally by building more barracks.

In the third class of posts were the permanent and semi-permanent cantonments of the frontier areas, each of them accommodating from two to six companies of troops. These also suffered much illness from overcrowding and poorly constructed barracks. And here, too, Billings felt that at that time, adding more and better barracks was the only remedy that was feasible as well as effective.

The fourth class of army installation consisted of the rough temporary garrisons or camps that were built hastily near points of Indian warfare and often just as quickly abandoned. Under these conditions, there was little one could do to improve the barracks at such posts, even though they tended to be badly overcrowded and smoke-filled, while the chinks in their walls made them bitterly cold in the winter. However, Billings felt that the resulting abundance of fresh air in such barracks could be regarded as a significant hygienic compensation.

He also pointed out the fact that under the fast-moving military circumstances, the current construction needs of front-line Army units were for carpenters rather than architects. But he reminded his superiors that the eventual end of hostilities would require the adoption of informed hygienic barracks planning and design in the West as well as elsewhere. His first survey report therefore included much detail on the principles of air circulation, devices for ventilating barracks in both warm and cold weather, and illustrations of recommended stoves, flues, and other equipment. In the process, he outlined the basics of a functional barracks design: simple, practical, and economical, as well as presumably effective in minimizing or warding off the common communicable diseases, according to the age's etiological beliefs. However, while making these observations Billings had to tread carefully in making significant criticisms. This was necessary because the army agency in charge of barracks design and construction was not the Medical Department but the Quartermaster's Department; and the Quartermaster General, Montgomery C. Meigs, with his eminence as an

engineer and architect, understandably retained much proprietary interest in such matters.¹⁰

The hygienic situations of post hospitals differed little from those of the barracks, at least as shown in the first phase of Billings's survey. They, too, were affected by the various combinations of geography, military strategy, and army turf politics, as well as by epidemiological considerations. And with such buildings as well, he was above all concerned with structural factors, with matters of design, amounts of air space per occupant, and provisions for ventilation or, in short, with achieving the planned prevention of hospital infection. Post surgeons at new and temporary camps in the West used their reports to draw Washington's attention to the often inadequate makeshift hospital structures in which they had to function, variously with leaking roofs, dirt floors, and poor facilities. However, Billings particularly aimed in his first stage report to illuminate the health status of those army hospitals that had been planned and for which builders' designs existed. Thus, to augment the post surgeons' narrative descriptions of those hospitals, he went out of his way to illustrate the accounts with floor plans where they could be found. The result was an unusual collective summation of the hygienic status and experience of a considerable chain of very small hospitals.

Little if any effective American effort at military hospital standardization had been made prior to the Civil War.¹¹ While Hammond had first spurred this process, it was Barnes again who continued this impetus and carried it into the postwar period. Joseph J. Woodward emerged as Barnes's principal hospital planner during the war.¹² Subsequently, in the

¹⁰ H. C. Abbot, "Montgomery C. Meigs," in National Academy of Sciences, *Biographical Memoirs*, Vol. III, 1895.

¹¹ Various suggestions for improved military hospital design and ventilation were made by military surgeons of the Revolutionary and early Republican periods, among them Edward Cutbush and James Tilton. However, few if any were tested sufficiently to gain acceptance as official standards. For a short commentary, see Cassedy, *Medicine and American Growth*, pp. 14-23.

¹² Woodward gained authority in this area through his two wartime volumes: *Outline of the Chief Camp Diseases of the United States Armies* (Philadelphia: Lippincott, 1863); and *The Hospital Steward's Manual* (Philadelphia: Lippincott, 1863). See also, Woodward, "Hospital Organization and Construction," in Surgeon-General's Office, *Circular No. 6* (Philadelphia: Lippincott, 1865); and

mid-1860s and 1870s, Woodward was joined by Billings and others in the Surgeon-General's Office in drafting successive official documents on the subject. These circulars provided standard specifications for various sizes of small hospitals, though most of those actually built during the period were for 12 or 24 beds.

Around 1870 these planning activities gained added significance by attempts within the Medical Department to take over from the Quartermaster's Department at least some of the authority to build and repair hospitals.¹³ In any case, in 1870, in his first survey report, Billings urged all Army hospital builders to follow the Surgeon-General's Circular No.4 of 1867. This was a document that he and his colleagues had participated in preparing. And now it was their "Bible", a document that they then believed "embodied the true principle[s] of hospital construction." Drawing from that document, he endorsed the pavilion style of Florence Nightingale as well as of the French and British authorities as the "model" for American military hospitals. He went on to review that style's by-then familiar specifications: a small isolated structure or cluster of small structures, built if possible with non-absorbent walls and floors with no cracks, but well-ventilated, and generously provided with at least 1200 cubic feet of air space for each bed.

When he examined the post reports and hospital plans, Billings found that only a few American army hospitals met or came close to those European standards. He dismissed the plans of others as examples of "how not to do it." In some post-war hospitals the standards and specifications proved to have actually been altered or ignored by outside building contractors, particular where there had been no medical advice or supervision. However, by far the largest number, he observed, were built according to no special plan at all. Nevertheless, whatever their defects, even those structures, being mostly small in size and presumably not conducive to far-reaching hospital infections, could still be regarded as being as satisfactory as the typical cottage hospital of the English. This conclusion was borne out, he argued, by the overall mortality statistics of the American military hospitals, which actually compared favorably with data of private hospitals in the United States and Europe.¹⁴

United States Surgeon-General's Office, *Approved Plans and Specifications for Post Hospitals* (Washington: Surgeon-General's Office, 1871).

¹³ Gillett, *Medical Department, 1865-1917*, p. 4.

¹⁴ Billings, *Barracks and Hospitals*, pp. xx-xxiii.

In 1870 Billings completed the editing and publishing of the information he had assembled during this first phase of his survey. This done, he immediately began collecting material for the second phase. In this latter phase, he aimed to draw attention to two additional aspects of military hygiene, food and clothing, and to a lesser extent on the almost non-existent hygiene of guard-houses, while he also updated some of his earlier findings on hospitals and barracks. He had little fault to find with Army clothing, which seemed to have been steadily improving in quality. And the same was true of food, in sharp contrast with the state of barracks hygiene. Billings here in effect continued to be of the opinion that in America "we have the best-fed and the worst-housed Army in the world."¹⁵ While he found that the use of double-deck bunks was becoming much less and also that other improvements had been made in barracks, overcrowding continued to be a grave problem. Yet, even within the Army leadership, there were some planners who did not yet take that problem seriously. One new proposal for barracks construction that he found being circulated at this time not only provided for sub-standard amounts of air space in the barracks but made "no arrangements for ventilation and no provision for bath-rooms."¹⁶

At the same time, some of Billings's initial assumptions about these matters were being overtaken by new knowledge. In fact, almost before the ink was dry on the 1870 report, the Army's official position on hospital hygiene had to be reformulated in some fundamental respects. This was necessitated by the completion in the Surgeon-General's Office of analyses of Civil War statistics of hospital morbidity and mortality, together with the publication abroad of similar data on European wars. As he worked up his second report, then, Billings had to admit that Nightingale's pavilion plan, "which for a time was supposed to be a perfect panacea against all evil, has been found, by sad experience, to furnish no security against the evils [of] 'hospitalism'." Admitting also, along with physicians everywhere, the continuing basic lack of factual knowledge about the causation and spread of communicable diseases, he had to explain that for the time being any specifications for hospitals would have to remain provisional. Thus the new provisional model in the American Army was to be the "barrack hospital," of which Billings considered the chief virtue to be the fact that they would be "temporary wooden structures." Intended to last but ten or twelve years,

¹⁵ *Ibid.*, p.xxxii.

¹⁶ Billings, *Report on Hygiene*, p.ix.

they offered the hope of keeping the dangers of hospital infections to a minimum, at least in the small western garrisons.¹⁷

When Billings summed up matters in 1875, at the end of the survey's second phase, he felt that the hygienic outlook for the field posts had already been improved, especially by two War Department administrative changes made partly as a result of the exposes and recommendations of the 1870 report. Through the first, post commanders were now required to give at least some consideration to the suggestions of post surgeons for hospital construction or repair and to their other medical advice. But even more significant, he thought, was a 1874 order that began to broaden the work of those surgeons by giving them additional duties as "sanitary officers", with oversight not merely within the hospitals but over all aspects of post hygiene.¹⁸

Whatever his own views on preventive medicine and hygiene were when he began his survey in 1868, Billings came to believe that army line officers as well as medical officers had responsibilities along those lines. He did not claim that cleanliness was next to godliness. Nevertheless, he argued, passionately for him, that the modern Army must embrace all aspects of Victorian hygienic idealism, if possible even at the most remote frontier posts:

"Next to fresh air and proper food, personal cleanliness is the most important agent in preserving the mind and body in proper working order, and it is not only a duty, but in the highest degree good policy and economy, on the part of the Government, to provide the necessary facilities. A dirty man will, in most cases, be a discontented, disagreeable, and dissolute man; for the condition of his skin has much more to do with a man's morals than is generally supposed."¹⁹

Physical Location, Morale, and Health Calculus of the Western Posts

The official reports that the post surgeons sent to Washington for the post health survey did not, of course, reveal the senders' personal feelings or mental states. However, the reports did include information having to do

¹⁷ *Ibid.*, pp. liv-lv.

¹⁸ *Ibid.*, pp. v-vii, xviii-xix, liv.

¹⁹ *Ibid.*, p. x.

with post locations and communications arrangements, factors that often influenced those feelings or states. Moreover, the reports were significantly supplemented, at least as historical records, by the extensive informal correspondence during the same period between Billings and the individual military surgeons at posts all around the United States, many of whom were his long-term service colleagues and friends. Since the operations of the Medical Department as well as of the Army generally were so heavily centered in the West during this period, I will limit my discussion here to morale problems of that region's posts as revealed in the correspondence of selected surgeons.²⁰

These letters reveal Billings managing his survey of western military medicine almost entirely from his desk in Washington. And, taken together, they hint at his feelings about the West. They suggest an unromantic man who, having earlier in life escaped from the hardships and cultural aridity of rural Indiana, not far back of the frontier, had no desire to go back to the West. At the same time, however, the letters reveal that the career surgeons in the West had a very considerable admiration for, confidence in, and dependence on Billings, so much that they often felt free to lay bare to him some of their most personal emotions, problems, and needs.

William Goetzmann, a few years ago, characterized post-Civil War military service along the Western frontier as a new chance for the professional soldier to gain glory or at least to take part in "a great and inevitable epic adventure."²¹ But western service in the Army's Medical Department seems to have offered a much more restricted range of opportunities. Perhaps a few surgeons did hope to gain glory. And some were undoubtedly happy to get the occasional chance to look for specimens of the local flora and fauna or to explore the geology. However, a substantial proportion were known to have predominantly negative sentiments about their western experience. In particular, those who had scholarly pretensions or medical ambitions made no secret of their feeling that assignments to such duty were like being sentenced to exile. Among them, those whose medical tasks were largely

²⁰ These manuscripts are in the JSB papers, NLM.

²¹ William H. Goetzmann, *Exploration and Empire: The Explorer and the Scientist in the Winning of the West* (New York: Knopf, 1966), p. 391. For other dimensions of the western military presence during this period, see Robert Utley, *Frontier Regulars: The United States Army and the Indians, 1866-1890* (New York: 1973).

confined to the tiny frontier garrisons found their lives severely circumscribed and filled with drab routine.

Accordingly, the letters of such surgeons to Billings were often gloomy and pessimistic, dwelling on such matters as the harshness of the weather, the spartan character of their living accommodations, their isolation from the medical life and "civilization" of the East and North, and the frequent barrenness of the landscapes. The surgeons also wrote him about such things as the depressions they went through when separated for long periods from families and friends; about the intermittent frightful deaths of colleagues in military ambushes or engagements; but, more often, about the pervasive boredom of it all.

Well aware of Billings's influential position in procurement and supply matters, some of the surgeons complained about the chronically decrepit state of their hospitals and made sure to refer in their personal letters to their pending official requisitions for clinical thermometers, steam atomizers, surgical instruments, and other equipment. Others lamented the built-in obstacles that the frontier posts posed to scientific activity or professional improvement of any kind and begged Billings to help them somehow. In sum, as Surgeon Ely McClellan scribbled to Billings in 1869 from Fort Garland in Colorado Territory, "one gets wonderfully demoralized out here." Like not a few of his colleagues around the frontier, McClellan added that from time to time he found himself wondering if he would "ever be fortunate enough to return to paradise," i.e. to the East, or whether he might somehow be forgotten by Washington and left in permanent exile.²²

Through these postwar years, then, Billings was the confidant and advisor of many of these field surgeons, and sometimes he served as an intermediary for the exchange of news about distant army colleagues. Often he was called on to explain the fine points of new departmental regulations, to find out what he could about the surgeons' chances of getting leave or being reassigned to some new post, or to do more tangible favors. Among the latter, when it was possible, he ordered needed books, got broken instruments repaired or replaced, or needled the Quartermaster's Department to carry out promised repairs to post hospitals. Billings became known to frontier surgeons as their most useful and authoritative contact back in Washington,

²² McClellan to JSB, April 4, 1869, JSB papers, NLM. For other aspects of frontier medicine, see James O. Breeden, ed., *Medicine in the West* (Manhattan, Kansas: Sunflower University Press, 1982).

often simply because he was “located at the focus of all official intelligence.” One correspondent wrote that Billings’s favors were “vitally important to the happiness and success of a frontier officer.” And arrivals of his letters were in themselves welcome events because they brought news of the outside world to the many who felt that “we are almost out of the world here.” As time went by, however, during the 1870s, both their frequency and their personal warmth tapered off to some extent as Billings’s other assignments multiplied and consumed more of his time.²³

Central to the depression and sense of isolation that weighed on many of the western surgeons throughout the 1860s and ’70s, just as before the war, were the great distances of most of the posts from each other as well as from sizeable civilian communities. A large part of the problem was the painfully slow pace of moving to and from or otherwise communicating with that outside “civilized” world. Back in Washington, Billings early realized that these same factors compounded the difficulties of gathering accurate and timely information for his surveys. It was evident, moreover, that at least for the present, adverse geographical and logistical situations seriously interfered with his efforts as purveying coordinator to get even the most basic medical supply items to the western posts on any regular or expeditious basis. They also made it unrealistic for him to expect to be able to bring about any extensive hygienic improvement at field installations overnight. Nevertheless, in the hope of stimulating some kind of improvement in the situation, he planned the surveys so as to make the existing physical realities and limitations of medicine at such posts perfectly clear to other military planners in Washington.

For the first phase of his survey, then, between 1868 and 1870, Billings urged the field surgeons to include in their reports and letters all possible data pertaining to the geographical situations and medical logistics of the posts. The latter responded with an abundance of data that made clear the still formidable distances to or from the closest cities, to the nearest posts that could be called upon in emergencies, and from the regional medical supply depots. They also provided information about the mail service and other modes of communication and transport. And some mentioned the presence or absence of railroads.

²³ Warren Webster to JSB, Jan. 28, 1869, and July 24, 1868; H. Stille to JSB, April 30, 1868; all in JSB papers, NLM.

Whether it was acknowledged as such or not, the post-Civil War prospect of the coming of the railroad into trans-Mississippi America quickly became a central consideration, alternately hopeful and discouraging, in the thinking and reporting of the western surgeons. It likewise became an increasingly potent ingredient for Billings and others at the Surgeon-General's office who were involved in the army's medical planning for the Indian wars. The general symbiotic relationship of the army and the railroads in the process of opening up of the West is, of course, well known. Railroad builders depended on detachments of Army troops for protection during the construction stages, while Army commanders looked forward to ever more rapid rail transport to hasten the movement of troops and supplies into the area and generally to prosecute the wars.

In turn, military medical personnel at all levels also had a stake in the rapid coming of the railroad. Front line medical officers in particular saw it not as some abstract symbol of the changing West but as a concrete agent that could help in offsetting if not eradicating the harsh and hostile features of the frontier, for themselves as well as for the troops. At that early date, before the various rail lines were completed and began taking large quantities of people into the area, the medical officers and planners were not yet concerned with the threatening potential of those lines for the rapid spread of epidemic disease. Rather, from Billings and the Surgeon-General to the western departmental medical directors and individual post surgeons, the advancement of the railroads was a marker on the way to a substantial hoped-for improvement of western military medicine. It marked the status of Washington's efforts to maintain medical supply and communication links with the western posts, to upgrade the barracks and hospitals, to gradually improve professional opportunities for western army surgeons, and to facilitate the spread among the latter of the era's new medical and scientific ideas.²⁴

Among the earliest western posts to benefit from proximity to the new railroads were those whose troops actually guarded the construction of the Union Pacific Railroad as it pushed across the prairies during these same years. From Ft. Sanders in Wyoming Territory, for instance, Surgeon J. H. Frantz wrote that the railroad had reached them in 1868, that they now

²⁴ For a general account of this country's railway history, see Maury Klein, *Unfinished Business: The Railroad in American Life* (Boston: University Press of New England, 1994).

received mail every day, and that they were now only thirty hours away from the headquarters of the Military Department of the Platte.²⁵ During the seven years of Billings's survey, the thrust of trans-Mississippi railway construction continued to proceed spiderlike and with remarkable rapidity into some of the territories covered or touched by the western military empire. As this occurred, additional surgeons could report that their posts were now on railway lines or had fairly easy access to them. The morale of some, like those at Fort Garland (in Colorado Territory) in 1875, was thus immensely boosted by the news that railway construction would reach to within fifty miles of their post in another year.²⁶ However, a large proportion of the western posts, in 1875 as in 1868, remained several years away from gaining the improved communications, security, and access to medical and other resources, and hence also to achieving the improved morale that the railroad was promising to make possible in the area.

Reports to Billings from posts in Texas illustrate the varieties of logistical problems and medical communication conditions that continued to be revealed by the survey. Surgeons at Austin considered that their assignments in that city were enhanced by the city's pleasant climate, abundant water supply, and general healthfulness. However, in 1869 they also had to put up with such frustrations as the fact that the city was still 100 miles from the nearest railroad terminus, near Brenham, while medical supplies, which were shipped from distant New Orleans, often took as much as three months to arrive. Fort Griffin in 1869 was 150 miles away from any other fort, and so far out into the wilds of Texas that its precise geographical location had not yet been ascertained. Fort McIntosh, almost as remote, was supposed to have weekly mail delivery, but actual service was often delayed two to three weeks by floods or Indian attacks, while the nearest railway terminus, 350 miles away, was not expected to get closer in the near future. Fort Concho, like other posts, still obtained most of its medical and other supplies by heavy army wagons laboriously hauled over rutted dirt roads for long distances. The quartermaster depot at San Antonio was 230 miles away, and the next closest city was 550 miles away. And, as surgeon W. M. Notson advised Billings, "when the rainy season sets in, communication [to or from Fort Concho] almost ceases."²⁷

²⁵ In Billings, *Barracks and Hospitals*, pp. 353-356.

²⁶ Billings, *Report on Hygiene*, pp. 257-262.

²⁷ Billings, *Barracks and Hospitals*, pp. 177-181, 194-202, 215-217.

Fort Gibson, in Indian Territory, while having less malaria now than before the Civil War, still retained the unenviable reputation of being “the charnel-house of the frontier.” Located near a vast swampy area, moreover, it still had in 1870 to rely almost exclusively upon boats for its contacts with the outside world. Many of the fort’s foods and general supplies came by this mode of transport from the Army’s quartermaster depot at Fort Leavenworth some 297 miles distant, while medical supplies had to travel even further, from the medical purveyor’s depot at St. Louis. As long as they were carefully packed, the supplies could make their way to Fort Gibson safely if slowly via the Arkansas River. However, the operation required considerable advance planning, since that river was normally open to traffic only six months of each year.²⁸

The delays and uncertainties caused by such conditions often forced medical staff officials in Washington to send repeated followup messages in their efforts to confirm receipt of supply shipments or otherwise to communicate with frontier posts. Billings, like the others, chafed under communications delays, particularly those occurring when he was trying to adjust apparent discrepancies in information sent from the posts for his survey. When there was a lack of news, he sometimes assumed that the post surgeons were to blame. But Surgeon Warren Webster in Texas, for one, did not let him get away with that assumption: “If you appreciate our want of railroads and regular mail communication, you will understand the great delay in supplying your office with corrected statements.”²⁹

The geographical and medical-logistical data that actually did reach Washington enhanced the administrative value of Billings’s two survey publications. In both works, the large numbers of sanitary reports from western posts—114 out of the 188 that reported in 1875—continued to reflect the Army’s heavy concentration of strength in the West for its pursuit of the Indian wars. They also revealed how thinly the posts were spread over the vast western territory, and above all, how sparse were the numbers of surgeons and other medical personnel serving that territory.

In both of his reports, Billings grouped the various posts according to their location in the respective military departments. However, in 1875, he gave increased emphasis to the geographical, administrative, and medical significance of those departments, particularly those in the West. For them,

²⁸ *Ibid.*, pp. 263-267.

²⁹ Webster to JSB, 1/25/1869, JSB papers, NLM.

he provided a foldout map which indicated the locations of the military posts and any sizeable settlements or towns as well as of the region's principal communication routes, their navigable rivers, stage routes, wagon roads, and railroads. Elsewhere through that report he inserted mileage charts of each department, at least in part as reminders to medical planners both in Washington and in the West of the always crippling distances from almost every western post to the other posts and supply depots in the same department. And in some instances he was able to get the medical directors of the departments to contribute general summaries of or commentaries on the medical facilities or problems of the posts in their jurisdictions.

As Billings's earliest major publications, the survey reports of 1870 and 1875 were instrumental in focusing the Army's attention upon a wide range of its post-Civil War field health conditions, problems, and goals. They confirmed the value of disseminating preventive medical concepts among commanding officers as well as medical officers. They likewise helped the army fashion a leaner, more efficient, and more centralized medical empire for the 1870s and 1880s.³⁰

The reports were of even greater importance in bringing Billings and his scientific work to the attention of medical professionals and officials outside the Army, both in other governmental agencies and in civilian circles around the country. Gaining the most attention initially were his studies of hospital hygiene. In fact, well before he even finished his final survey report, his services as hospital planner were already being solicited outside the Army. His acceptance of an invitation to do such work for the trustees of the Johns Hopkins Hospital during the 1870's and '80s in themselves brought him immense prestige. Moreover, his parallel appointment as consultant for the Johns Hopkins University led to further attention with his radically daring academic plans for the medical school.

³⁰ JSB to the Surgeon General (draft), 5/13/1886, JSB papers, NLM.

Chapter 3

Army Models for the Johns Hopkins Medical Institutions

In early 1876, leaders of the Army Medical Department readied the objects that they planned to show off at the forthcoming international centennial exhibition in Philadelphia. Their actual display turned out to be both substantial and impressive. Included, for instance, were Civil War photographs and other objects from the Army Medical Museum; medical instruments and equipment used by the field surgeons; volumes published thus far in the *Medical and Surgical History* project; copies of the Department's other recent publications, including Billings's two survey reports as well as his prospectus for the forthcoming catalogue of the Surgeon-General's Library; and examples or models of artificial limbs, medical wagons, and modes of transporting the wounded, including litters, ambulances, railway cars, and steamships.

Particularly prominent in the Department's exhibit were examples and models of the American army hospitals. One of the exhibit rooms displayed a number of models built to scale by Washington architects and builders. Four of them represented actual hospitals that had been built during the Civil War, while a fifth represented the standard 12-bed peacetime barrack ward that had evolved since the war. Meanwhile, the structure which housed these and most of the other displays was a full-sized and completely outfitted standard peacetime post hospital for twenty-four beds.¹

¹ J. J. Woodward, *Hospital of Medical Department, United States Army. Description of the Models of Hospitals* (Philadelphia: International Exhibition of 1876, 1876).

Army Hospitals, the Johns Hopkins Hospital, and Beyond:

The army's hospital displays may well have had the effect, at least indirectly, of stimulating public interest in obtaining hospitals in the many American communities that still lacked them. Moreover, even before the Philadelphia exhibition, Billings had turned some of his attention to the shaping of civilian or non-military federal hospitals.

As early as 1869, at the request of George S. Boutwell, the Secretary of the Treasury, the Army officials detailed Billings to survey the Treasury Department's small and at the time admittedly shabby network of marine hospitals. During the next year, the latter, with a Treasury official, William D. Stewart, made a number of quick visits to some two dozen or so government-owned institutions and rented facilities scattered along the coasts and interior waterways. Some of these structures had been already closed, and Billings suggested that various others, found to be poorly located or otherwise unsuitable, be sold. At several locations, he examined plans for modifications of existing hospitals or for new buildings. And he urged the responsible officials, where possible, to eliminate the traditional permanent masonry structures in favor of the temporary wooden barrack hospitals that the Army was leaning toward. Actually, Billings's survey was rapidly completed, and it ended with the conclusion that, among the remaining ten hospitals that were in active use, almost all had physical, administrative, and/or hygienic deficiencies that required attention.

Back in Washington, Billings's report to Secretary Boutwell necessarily detailed those deficiencies. However, as its central feature, he presented a two-part plan for the Treasury Department not just to improve the individual hospitals but to elevate them drastically in function and status. His idea was first to create a central supervisory unit to standardize and administer the various hospitals, and then to insure the unit's success by effectively removing each of the hospitals as soon as possible from local politics.

While no full copies of Billings's report have survived, it is known that Boutwell accepted most or all of it and promptly obtained legislation to implement the suggested changes. Boutwell originally favored Billings for appointment to the new position of Supervising Surgeon of what was to be called the Marine Hospital Service, and Billings was almost certainly interested in being asked to take on the task, perhaps as an added part of

his Army duties. However, Congress, in the enabling legislation, voted to make Army officers ineligible for the post.²

The actual first head of the new agency, John M. Woodworth, a competent and ambitious former army officer, almost from the beginning steered the Service onto a course that quickly came into conflict with some of the public health interests and programs being shaped for the Army by Billings. However, the latter's continuing work on hospital design and hygiene does not appear to have been negatively affected by what became a nasty inter-agency rivalry.³ Fortuitously, in fact, several major opportunities that came to Billings during the 1870s enabled him to satisfy much of postwar America's urgent need for leadership in hospital design and building, both military and civilian. His particular contribution during that period was his insistence on significant new levels of hygienic specifications and technological standards.

A crucial step in this was Billings's decision, after getting necessary clearance, to turn some of his attention away from the hygiene of the small army hospitals of the frontier and to undertake some experiments with civil institutions and their hygiene. He was well aware of the concern of civilians and professionals alike with the frequently severe sanitary and engineering problems in larger permanent hospitals. With this in mind, Billings in 1872 prepared a plan for a permanent and "rather expensive" hospital to be erected by the Army as part of the United States Soldiers Home, in the northern outskirts of Washington. It was to be a four-story brick structure to accommodate fifty patients and was to incorporate a number of special features. Among these, he designed it to be a model of hospital building technology. It would include "all the most recent and improved appliances," especially the machines and equipment required for effective ventilation

² Although no scholar has yet unearthed Billings's actual report to Boutwell, several have provided challenging, if fragmentary and sometimes speculative, accounts of Billings's survey and of his subsequent relations with the Marine Hospital Service. See, in particular, Chapman, *Order out of Chaos*, pp. 85-89, and 359-360; and Bess Furman, *A Profile of the United States Public Health Service, 1798-1948* (Washington: G.P.O., 1973), pp. 114-127. Billings himself left an untitled and undated (probably 1869) manuscript memorandum booklet of very short rough notes on his visits to about fifteen of these hospitals. JSB papers, NYPL.

³ Some ramifications of this rivalry are touched on in Chapter 6.

and heating. At the same time, it was “an attempt . . . to solve some of the problems of hospital construction as presented in civil life,” notably to find a way to eliminate or at least diminish “hospitalism”, the frequently devastating spread of communicable diseases among the crowded populations of patients in urban hospitals.⁴

Billings's plan, including its research components, which were possibly unique at the time, at least in the United States, was quickly accepted since Barnes was also one of the Commissioners of the Soldiers Home. The Commissioners then selected Edward Clark, Architect of the Capitol, as their architect and designated Billings as their consultant to supervise construction. Work on the structure began in 1873 and, under the name Barnes Hospital, it was completed late in 1875.⁵

During construction and for some time afterward, Billings had the services of several other Army Medical Department employees, especially for the research phases. Surgeon David L. Huntington joined the project on a full-time basis, while Surgeon Robert Fletcher and others, along with civilian consultants, did part-time tasks. With this help, Billings was enabled to carry on a continuing program of experiments upon the hospital as a building, with special attention to the hygienic aspects of its interior furnishings, equipment, and appliances. Some of the experiments were modelled on those of Pettenkofer and other European sanitarians, but many were original. Members of the Army team tested the effectiveness of the various shapes and sizes of flues, fireplaces, registers, and heating coils. They compared the power of different blowers, the efficacy of different sized furnaces, the efficiency of varieties of coal. They looked into the question of the retention or spread of infective agents by various kinds of wall coverings and floor materials. They made round-the-year observations of the performance of ventilation and heating

⁴ Billings, *Report on Hygiene*, pp. liv-lv. The undertaking of this new hospital was almost certainly prompted, at least in part, by inquiries both to Barnes and Billings as early as 1871 from the trustees of the future Johns Hopkins Hospital in Baltimore, with Billings's friend Alfred Whitehull acting as intermediary. Whitehull to JSB, 6/8/1871, JSB papers NLM.

⁵ See manuscript minutes of the Board of Commissioners of the United States Soldiers' Home, Washington, D.C.; Board meeting files of November 9, 1872 (no. 19.Doc); April 12, 1873 (no. 19.Doc); October 22, 1873 (no. 20.Doc); September 15, 1875 (no. 22.Doc); at U.S. Soldiers' Home, Washington, D.C., courtesy B. X. Smith.

systems under successive seasonal and weather conditions. And they brought in experts to do chemical analyses of gases found in the structure.⁶

In 1875, before the completion of the Barnes Hospital, the trustees of the projected Johns Hopkins Hospital in Baltimore invited Billings and four other American physicians to submit plans for what was to be a large new hospital facility. The following year, with the Army's concurrence, the trustees selected Billings to be their permanent consultant for the project. As an early task, he participated with them in evaluating and adopting the good features of all five of the submitted plans. Billings then made an inspection tour of selected European hospitals, after which he joined with the trustees and the architect, John R. Niernsee of Baltimore, in working out a final building plan. Construction work began in early 1877. Billings went on to provide expertise and oversight throughout the construction period, which, due to periodic financing difficulties, was spread out over the next twelve years.⁷ Throughout this period he handled most of the background analysis

⁶ Billings left several short discussions of the Barnes Hospital: Billings, *Report on Hygiene*, pp. liv-lvi; Billings, "Hospital Construction and Organization," in Johns Hopkins Hospital, *Hospital Plans: Five Essays Relating to the Construction, Organization, and Management of Hospitals* (New York: Wm. Wood, 1875), pp. 1-46; and Billings, *Report on Heating and Ventilation Prepared for the Trustees of the Johns Hopkins Hospital* (Baltimore: Wm. K. Boyle, 1878), pp. 19-76.

Carlo Biagini has examined similar contemporary Italian innovations in hospital design in the context of that country's emerging field of hygiene, one "incorporating medical, statistical and technological" elements, as well as administrative. See his "Ospedali Vecchi E Nuovi: Il Dibattito Tecnico-Culturale sul Rinnovamento delle Strutture Ospedaliere nell'Italia Post-Unitaria. II. Caso del Santa Maria Nuova a Firenze," *Nuncius*, Vol. III, no. 1 (1998), pp. 139-150.

⁷ For the European history of hospitalism, as well as an account of the early Johns Hopkins Hospital, see Guenter Risse, *Mending Bodies, Saving Souls: A History of Hospitals* (New York: Oxford University Press, 1999), pp. 366-372, and 402-408. For other special studies, see Toby Gelfand, "11 January 1887, the Day Medicine Changed: Joseph Grancher's Defense of Pasteur's Treatment for Rabies," *Bull. Hist. Med.*, 2002, Vol. 76, pp. 698-718; Gert H. Brieger, "The Original Plans for the Johns Hopkins Hospital and their Historical Significance," *Bull. Hist. Med.*, Vol. 39 (1965), pp. 518-528; A. McGehee Harvey and Susan L. Abrams, "John Shaw Billings: Unsung Hero of

and other intellectual work of the project from his desk in Washington. But during its active phases he took the train to Baltimore once or twice per week for on-site consultations with the trustees, the architect, and the builders.

Billings's selection for the Johns Hopkins Hospital project thus coincided closely with the development and testing of Barnes Hospital. As a result, at every stage of planning and construction, he was able to use the smaller hospital as the model for the larger one. He was careful to clarify to the Hopkins trustees in advance just what he contemplated for the Baltimore structure by going over with them details of the Barnes installation. Then, as construction proceeded on the larger hospital, the experimental findings that were being obtained at Barnes provided rational bases for his recommendations for solving numerous of the technical problems in Baltimore.⁸

The ultimate plan for the Hopkins institution provided for a complex of buildings—structures for laboratories, nurses' school and quarters, administrative offices, dispensary, kitchens, and so on—all in support of those containing the sick wards. Fully as much as at the Barnes Hospital, every unit was designed with the aim of utilizing modern building technology and materials in such a way as to ward off the incidence and spread of hospital infections. The experimental approach that he had been taking at Barnes was both expanded and refined for the new structure. For example, room materials as well as ventilation devices and systems were constantly being tested throughout the construction period, and those that did not work well were replaced by new and improved types. And such tests were intended to continue after the buildings were occupied. When the Baltimore institution finally opened in 1889, Billings stated his vision of that building complex as a continuing and flexible hospital model, as "a great laboratory for teaching the practical applications of the laws of hygiene to heating, ventilation, house drainage, and other sanitary matters."⁹

While the completed exterior facades of both the Hopkins and the Barnes hospitals were visually impressive, they actually had relatively little

Medicine at Johns Hopkins," *Maryland Hist. Mag.*, vol. 84, no. 2 (1989), pp. 119-134; Garrison, *Billings*, pp. 182-212; and Chapman, *Order out of Chaos*, pp. 99-144.

⁸ Billings, "Hospital Construction," *loc. cit.*, passim; Billings, *Report on Heating and Ventilation*, passim.

⁹ Billings, "The Plans and Purposes of the Johns Hopkins Hospital," *Med. News*, 54 (1889), pp. 505-510.

distinction, in contrast to that of Billings's frankly functional interior designs and construction. In fact, it was the latter elements, the solutions of practical interior problems in these two model hospitals, that were particularly welcomed in many circles and that greatly facilitated the spread of urban hospitals across late-nineteenth century United States. Information about them was disseminated first of all in the house publications of Billings and the Hopkins trustees and subsequently in the professional press. There was some complaint about the expense of such hospitals and some preference for systems or devices other than those selected by Billings, as, for instance, for steam heating rather than hot water. However, there seems to have been general agreement that the Billings model structures held one lesson above all others for American hospital sponsors and builders. They demonstrated that hospital design could no longer be a matter of guesswork. The process was now amply shown to be one that required exact mathematical and mechanical measurements for the planning of interior features and systems, together with special instruments for testing them. And equally essential was the active involvement in the process by technologically informed members of the medical profession, together with lay hospital officials.¹⁰

Having shaped his model urban hospitals, Billings was pressed to produce other structures along the same line. In fact, throughout the period of building the Hopkins hospital, and for two decades and more after its completion, he was in frequent demand—from hospital building committees, architects, medical societies, and others around the country—to comment upon proposed hospital plans, to suggest architects, or to prepare his own additional designs. In Washington itself, during the 1880s, Billings designed the administrative building and first medical wing of the Children's Hospital. In addition, as one of the Incorporators, beginning in 1882, he played a considerable role in the organization of the capital's new Garfield Memorial Hospital and went on to serve the institution in an active administrative capacity up to 1898.¹¹

¹⁰ J. R., "Art. XXVIII," [i.e. review of Billings's *Report on Heating and Ventilation*], *Amer. J. Med. Sciences*, n.s., Vol. 76 (1878), pp.523-524. No attempt is made in this chapter to examine Billings's comprehensive ideas about the management, staffing, or other non-technical matters pertaining to the Johns Hopkins Hospital.

¹¹ For Billings's Children's Hospital connection, see Miles, *National Library*, p. 110, note 69. For the Garfield Hospital, see Samuel C. Busey, *Personal*

Outside of Washington, certain other consultancies that Billings accepted also involved substantial commitments of time on his part. Particularly significant were his plans for the Peter Bent Brigham Hospital in Boston, the Memphis City Hospital, the Army and Navy Hospital in Hot Springs, Arkansas, and the Presbyterian Hospital in New York City. While his contributions to those institutions did not match his input to the Johns Hopkins project, the design details for each seem to have displayed originality on his part that was in keeping with local needs.¹²

Meanwhile, during the 1880s, Billings continued to play a role in updating hospital standards for the Army Medical Department. Although the opening of new Western posts had been tapering off, hospitals in America's existing posts had to be refurbished periodically using the newer hygienic standards. Occasionally, moreover, officials in foreign countries asked for printed copies of the Department's standards. In 1889, for instance, an official of the Mexican International Railroad, after a visit to the Army Post at San Antonio, wrote Billings for such a document, saying that the specifications for the Army's standard small-size hospital would be an ideal model of a medical institution for the railroad's employees.¹³

In his designs of urban civilian hospitals as in the army hospital models, Billings was concerned above all else with solving public health problems. Early in his career, along with most other hospital designers of that day, he thought that most hospital structures were in themselves potentially dangerous environments for the sick patient. By the early 1870s he had become persuaded that this danger came about essentially because of the presence of germs, though exactly how was still far from clear either to him or anyone else. At any rate, he laid out the matter very positively to the Hopkins Hospital trustees: "Whatever may be the opinions held as to the nature of these diseased germs, and their mode of origin and propagation, they are what we have to fear and to provide against in the construction of a hospital."¹⁴

Reminiscences and Recollections of Forty-Six Years Membership in the Medical Society of the District of Columbia (Washington: The Author, 1895), pp. 223-238.

¹² Plans or reports for several of these institutions may be found among the Billings papers in the New York Public Library, Box 68.

¹³ Albert B. Hale to JSB, 1/22/1889; and Charles Greenleaf to JSB, 1/29/1889, both letters in the JSB papers, NLM, Box 19.

¹⁴ Billings, "Hospital Construction," *loc. cit.*, p. 12.

By the time the Hopkins hospital was completed, the rapid expansion of bacteriological and hygienic research and discovery had greatly expanded man's knowledge about these matters. But much knowledge about these relationships was still only partially worked out and remained hypothetical. Accordingly, as the expensive structure was readied for its opening in 1889, with its elaborate ventilation system touted as a bulwark against hospital infection, Billings for the moment was correct in asserting that no other better solution yet existed. At the same time, he knew as well as anyone in the United States that the continuing explosion of knowledge about germs and their behavior could render the system archaic over-night.¹⁵ In fact, for a dozen or so years, he had been planning and organizing another Hopkins unit, the University's school of medicine, to have that very capability.

From Army Science to a Science-Based Hopkins Medical School

The Hopkins Hospital Trustees originally chose Billings as their consultant largely because of his consistently scientific approach to the planning and building of hospitals. And, in that same year of 1876, Daniel Coit Gilman, who had just accepted the presidency of the projected Johns Hopkins University, had much the same reason for selecting Billings as his consultant in building the University, especially the medical school.

¹⁵ For changing views in this period concerning the relationships of germs to diseases, see Nancy J. Tomes, "American Attitudes toward the Germ Theory of Disease: Phyllis Allen Richmond Revisited," *J. Hist. Med. & Allied Sciences*, 52 (1997), pp. 17-50; and James H. Cassedy, *Charles V. Chapin and the Public Health Movement* (Cambridge, Mass.: Harvard University Press, 1962), passim. Henry Hurd, looking back in 1913, summarized other shortcomings that, by the early eighteen-nineties, had been recognized in the just completed hospital, i.e., a lack of elevators, the smallness of service rooms, deficient laboratories, etc., but he felt that the building's subsequent influence on other American hospitals nevertheless remained very strong. Cited in Garrison, *Billings*, pp. 201-202. For Billings's later ideas on some of these matters, see JSB, "The Relationship of Hospitals to Public Health," in JSB and Henry M. Hurd, eds., *Hospitals, Dispensaries and Nursing* (Baltimore: Johns Hopkins Press, 1894), pp 1-7, and 122-212 passim.

Gilman himself, who most recently had briefly headed the University of California, had earlier been an educational reformer at Yale's Sheffield Scientific School. As such, he was well versed in the general development and potential of the sciences in the mid-nineteenth century, but not in American medicine, medical institutions, or physicians. By the time he had been in Baltimore a relatively short time, however, he had heard a good deal about Billings's remarkable knowledge of medicine, his skills in microscopy, and especially about his relentless drive to bring scientific information and methods into every aspect of medicine. and medicine.

During their initial exchanges, the two men presumably laid out their respective thoughts about medicine, science, and education, and gauged each other's presumed areas of similarity and difference. From the beginning, Billings seems to have been in fundamental agreement with Gilman's concept of the modern university, with its emphasis on instruction and research at the graduate level for the humanities as well as the sciences. And Gilman, in turn, liked what he heard about the other man as being essentially a medical scientist rather than a clinician.¹⁶

Getting down to work, Gilman started out in 1876 by giving Billings academic status as a part-time lecturer, and then, in essence, turned him loose for a year or so to prepare his detailed recommendations for the medical school. He also involved the other man in some of the university's earliest academic events. In the late spring, then, Billings, together with four other "learned professors" from Washington's scientific institutions—Cleveland Abbe, Simon Newcomb, Julius Hilgard, and Horace Hayden—could be seen at Gilman's inauguration as President and the following reception in a Baltimore hotel. In September, he joined a similar distinguished Washington science contingent that went to participate in the formal opening of the

¹⁶ The impact of the Hopkins phenomenon on American medicine has been penetratingly examined by Donald Fleming, *William H. Welch and the Rise of Modern Medicine* (Baltimore: Johns Hopkins University Press, 1954); and by Simon Flexner and James Thomas Flexner, *William Henry Welch and the Heroic Age of American Medicine* (New York: Viking, 1941). For Billings' Hopkins connections, see A. McGehee Harvey and Susan L. Abrams, "John Shaw Billings: Unsung Hero of Medicine at Johns Hopkins," *Maryland Historical Magazine*, vol. 84, no. 2 (1989), pp. 119-134. See also Kenneth M. Ludmerer, *Learning to Heal: The Development of American Medical Education* (New York: Basic Books, 1985), pp. 21-22, 51-61; and Chapman, *Order out of Chaos*, pp. 121-145.

university, an event highlighted by the address of Great Britain's apostle of evolution, Thomas H. Huxley.¹⁷

Late in 1877, after preliminary discussions with Gilman, Billings completed a tentative blueprint for the ultimate staffing, organization, scope, and courses of study of the university's medical school. Originally, as desired by Gilman, he presented the material in the form of a course of twenty academic lectures to the university community over a period of months. And then, after completing the course, he edited and revised the most relevant and timely portions of the lectures and had them published. In that format, the lectures went on to provide the essential authoritative basis for several years of sometimes heated discussion of what was a highly innovative and radical proposal for a medical school. If some of its elements did not survive that process, a major portion of them did. Above all, it incorporated three of Billings's most fundamental desires for the new institution: the medical school had to be closely integrated with the hospital; its academic program must be thoroughly grounded in the sciences relevant to medicine and in on-going laboratory research; and in other ways as well it should contribute to the American advancement of Europe's science-driven medical revolution.

By 1883, although neither the hospital nor the medical school facilities would be completed for another several years, Gilman, Billings, and the University Trustees agreed that it was time to begin assembling the medical school's earliest faculty members. First to be selected were Ira Remsen and H. Newell Martin, respectively the professors of chemistry and physiology, together with Billings. While Gilman originally wished to give Billings the professorship of hygiene, such an appointment of a career army officer was vetoed by the Secretary of War. However, permission was granted for Billings to serve as a lecturer of hygiene, an arrangement that made it possible for him to expand his role as scientist as well as to continue his advisory role to the medical school until the institution could be completed.

A few months after the first appointments, the Professor of Pathology and Dean William H. Welch arrived on the scene, followed shortly by William S. Halsted, William Osler, Howard A. Kelly, and others. While

¹⁷ See clippings in JSB papers, NYPL; also on microfilm at NLM, MS film 25, Reel 56, Vol. 3. For Gilman, see Daniel Coit Gilman, *The Launching of a University, and Other Papers* (New York: Dodd, Mead & Company, 1906); and, in brief, Francesco Cordosco, "Daniel Coit Gilman," *American National Biography* (New York: Oxford University Press, 1999), vol. 9, pp. 56-59.

none of these should be considered "Billings's men," they all had to pass his scrutiny. And all had to be fully as strong believers in scientific medicine as he was. Inevitably, then, virtually all of these first faculty members developed important professional ties with Billings over the next years. Moreover, most became more or less habitual users of the Surgeon General's Library.¹⁸

Billings and Welch got along well from the beginning. The two had met first in 1876 in Leipzig, where Welch was pursuing graduate studies and the other man was on a learning tour for various projects. Over their now legendary steins of beer at Auerbach's Kellar, Welch told Billings about his hopes for an American career in medicine and scientific research, and Billings told the younger man about his plans for building a science-based American medical school with high admission standards, small classes, well-equipped laboratories, and other European features. The two seem to have been mutually impressed. And when Billings's search started in earnest a few years later, he arranged for another meeting with Welch, by then in New York City, to confirm his highly favorable early assessment. Once Welch had taken over as Dean, the two were often in a position to support each other, not only in the growth of the medical school but in broader developments of public health, medicine, and science. And they could often be seen sharing their ideas and problems over dinner at the Maryland House or some other Baltimore establishment.

Billings also formed a special bond at Hopkins with the surgeon, Halsted, who operated several times on the former's lesions of the lip, conditions that were associated with his excess cigar smoking. Pleased with the care he received, Billings subsequently recommended Halsted to several of his Washington associates, including the geologist and anthropologist, John Wesley Powell.¹⁹

The clinician William Osler was one of several successful candidates for the Hopkins faculty who were already well known to Billings. In fact, the latter simultaneously became an active champion of Osler's candidacy in Baltimore, while also going to great lengths to persuade him to move

¹⁸ For the Billings blueprint, see JSB, "Suggestions on Medical Education," *Loc. Cit.* See also Fleming, *Welch*, *passim*; and Ludmerer, *Learning to Heal*, pp. 57-61.

¹⁹ The setting of the Leipzig meeting is perceptively drawn in Fleming, *Welch*, p. 55. For aspects of Billings's health, see William Pepper to JSB, 8/3/1880 and 8/19/1879, JSB papers NYPL.

from the University of Pennsylvania. Among other mutual avocations apart from business, both were avid bibliophiles, and both had more than casual interests in medical history. Actually, both thought of medical history as a part of the scientific knowledge that they wanted physicians to obtain. In fact, before Osler arrived in Baltimore, Billings had already started arguing that medical history should be made part of the curriculum of the new medical school.

Medical History in Army and University

By the early 1880s, Billings and Osler, who was still in Montreal, had begun corresponding in pursuit of their mutual bibliographical interests. And in 1881, the latter made a two day visit to the Surgeon General's Library expressly to examine the older works in the Army collection. Beginning around that date, Billings gave Osler borrowing privileges in the library and began as well to send him copies of its publications, including the earliest issues of the *Index Catalogue*. In turn, Osler reciprocated handsomely, first by sending Billings duplicate copies of books from his own library as well as hard to find copies of past Canadian medical institutional reports and the like.²⁰

Like other physicians of their times, both men were essentially self-taught so far as medical history was concerned. Billings's interest seems to have been kindled by occasional lectures on the subject by his professors at Cincinnati. But he rapidly made himself a true expert by his voracious reading in the growing collections of the Surgeon General's Library. As such, he helped spread the Library's good name by being able and willing to assist the patrons with their historical questions. However, he seems to have almost never used the collections for his own original historical researches. Until 1876, apparently the closest he came to such a use was in the preparation of finding guides to portions of the older collections.

²⁰ Osler to Billings, 6/3/1881; 1/5/1883; 1/18/1883, among others in Billings Papers, NLM. See also quotation from Osler's obituary of Fletcher, in Harvery Cushing, *The Life of Sir William Osler*, 2 vols. (Oxford: Clarendon Press, 1925), Vol. 1, p. 198. For Billings's relationships with Osler as well as other portions of this section, I have drawn considerably from my paper, "John Shaw Billings as a Historian," (Columbia, South Carolina: American Osler Society and University of South Carolina, 2002).

The first of these was a long journal article to mark the 100th anniversary of the country's independence. The article was basically a bibliographical summary of relevant holdings, though Billings enhanced the interest of some of the entries with personal comments. In his introduction, he described the work simply as a collection of "statistics obtained from a nearly complete list of the medical books published in this country from 1776 to the present time," together with data pertaining to medical societies, libraries, journals, and schools. As an annotated and classified historical directory, it served its purposes well. But it made no pretense to be a learned historical treatise.²¹

Some years later Billings issued a finding guide to another segment of the library's collections. Longer, but much like its predecessor in format, this work, the "History and Literature of Surgery," was a factual listing of surgeons, operations, and surgical publications of the past rather than a reasoned historical interpretation of that particular medical branch over time.²² The historian Fielding H. Garrison, writing after Billings's death, had mixed views about it as a contribution to history. Substantively, he considered it "the best work on the subject in English," one that displayed a "genuinely critical spirit." At the same time, however, he saw that potential readers must surely have often been turned off by its adherence to the government's dull bibliographical format. Its long lists of obscure and unimportant names not only made for "a certain dryness" but were contrary to Billings's "usual breezy spirit."²³

Between his writing of the two governmental "histories," Billings felt justified in accepting an invitation to undertake a very large and challenging writing project. He thus spent much of 1876 and 1877 in the intense task of researching and composing the twenty highly substantive academic lectures for President Gilman. It was an undertaking that he could not have even thought of without his intimate knowledge of and access to the Surgeon General's Library. Billings could, of course, have saved himself much labor by confining himself to the two or three lectures necessary to

²¹ John Shaw Billings, "A Century of American Medicine, 1776-1876: Literature and Institutions," *American Journal of the Medical Sciences*, 72 (1876), pp. 439-480.

²² John Shaw Billings, "The History and Literature of Surgery," in Frederic S. Dennis, ed., *System of Surgery*, 4 vols (Philadelphia: Lea, 1895), vol. 1, pp. 17-144.

²³ Garrison, *Billings*, pp. 181-212.

present his actual plan for the medical school. But he and Gilman agreed that considerable background information had to be presented as well if the project were to hope to gain the support of the university trustees and faculty as well as Baltimore's physicians and the public. Concluding that such justification could best be found in the historical record, Billings thus devoted thirteen of his twenty lectures to a comprehensive review of the medical lessons of the past. Eleven of them covered western medicine and medical education from antiquity through the eighteenth century, while two others dealt with the early United States. He devoted four lectures to reviewing the existing medical schools, medical legislation, and related matters in mid-19th century Europe, and then concluded with the three lectures giving his specific recommendations as to "the Course to be pursued by the Hopkins University."²⁴

The course was presented in a hall in downtown Baltimore as one of the earliest academic events of the new university. Contemporaries observed that in them, as in his other public appearances, Billings made an excellent impression as a speaker, that he was forceful, direct, and fluent in style. Contemporary opinion about the content of his specific medical recommendations seems to have been abundant and mixed, especially where it most mattered, among the trustees and in the encounters between Billings and Gilman. However, so far as I have discovered, there was next to no public reaction as to the content and quality of the thirteen historical lectures, even though when taken together they constituted one of the most comprehensive American reviews of the world's history of medicine to be undertaken up to that time.

In fact, it is remarkable that any of the lectures ever materialized. In 1876, when he had only barely begun his writing, Billings began to doubt that he would be able to produce anything of much originality or intellectual merit in the short time available. He warned Gilman not to expect anything of very high caliber and noted that the historical lectures he was working up were commonplace in content, of interest mainly to medical men rather than scholars. Increasingly dissatisfied with himself, he pointed out that,

²⁴ Billings's evolving ideas on the number and scope of the lectures in the course are indicated briefly in Sanford V. Larkey, "Two Letters by John Shaw Billings on the History of Medicine," *Bull. Inst. Hist. Med.*, VI (1938), pp. 394-398. See also Sanford V. Larkey, "John Shaw Billings and the History of Medicine," *Bull. Inst. Hist. Med.*, VI (1938), pp. 360-376.

to reach an audience of scholars, he would have to refocus his efforts in order to prepare lectures on the “philosophy of the history of medicine,” an approach which, by blending the history of medical knowledge with that of philosophy, government, science, and religion, for instance, would make for “a higher and better type of [historical] work.” Realistically, however, Billings had to face up to the fact that he could never find the time needed for writing such a work. “I could only do it by putting about a year’s reading and reflection into each lecture, since I must know much besides Medicine, to do it.”²⁵

Gilman ultimately persuaded the other man to continue with his lectures as originally planned. However, when they were completed, Billings refused to consider publishing them. As he reminded Gilman, there was already an overabundance of writings on the subject, “mostly copied one from another, even as these lectures must be in the main.”²⁶

With his heavy load of scientific and medical undertakings, Billings seems to have been far too extended in the years after 1877 to think of continuing his medical-historical initiatives at Hopkins through other lengthy lecture series. Clearly, his main commitments with Hopkins were to get the hospital and medical school built. From time to time, however, he agreed to give one of his historical lectures to groups at the hospital. And in 1886 he dickered with Henry P. Bowditch about the possibility of his giving six historical lectures at the Harvard Medical School. When the two men failed to agree on dates, a series of eight lectures was arranged at Boston’s Lowell Institute.

During this decade of the ‘eighties, before the Hopkins Medical School was ready to accept regular students, some of the faculty members were aware

²⁵ Larkey, “Two letters,” *loc. cit.*, pp. 395-396.

²⁶ *Ibid.* Fielding H. Garrison, considering the lectures in 1915, after Billings’s death, had no such criticisms. Actually, he seems to have found a greatly improved writing style, with no sign of the arid bibliographical format that had marred Billings’s governmental histories. Garrison also noted that the lectures reflected the German historical medicine of the day. However, he did not specify any particular scholar who may have influenced Billings in this respect. He might have plausibly argued that historian Herbert Baxter Adams, whom Gilman had brought to Hopkins at the same time as Billings, could well have exerted such influence. But presumably the evidence wasn’t there. Garrison, *Billings*, pp. 202-203.

that Billings's original recommendations for the school included provisions for some sort of graduate level academic program in the history of medicine, one that would incorporate and apply the research ideal and methods of the school's other departments. His justification of that revolutionary proposal was still appropriate for an expected student body that was to be composed of individuals planning to teach, write, and/or carry on research. Courses in medical history would be essential for them, Billings thought, not only as "stimuli to thought" but in providing "means of culture." And the absorption of bibliographical methods in the history of medicine department would be valuable not only to those training to practice medical history but also to those remaining in science positions.²⁷

Not surprisingly, Billings's medical history proposal had little chance of going very far during the Hopkins Medical School's organizational period. Billings himself never expressed interest in playing a permanent academic role in it. And, apart from him, there was probably no other commanding figure or scholar in the United States who could organize and take over such a program. There were also few anywhere else. Moreover, in 1892, when the Medical School finally opened, it had no visible means of financing such a program. Nevertheless, possibly in the hope that Billings would finally turn out to be available to help launch it, the school appointed Billings to a lectureship in the History and Literature of Medicine, one that he retained until 1905. Actually, however, during that period he never found time to present a full course of lectures in any one year and only rarely gave more than three annual lectures.²⁸

After 1905, the Hopkins school failed to find anyone to continue the history of medicine lectureship or other arrangement. However, Billings's vision of a graduate level program or department for the subject, though quiescent, was somehow kept alive in the School, at least in the spacious mind of William H. Welch. And ultimately it came to fruition with the creation, funding, and buildup of the Institute of the History of Medicine in the 1920s and 1930s.²⁹

²⁷ John Shaw Billings, "Suggestions on Medical Education, 1878," reprinted in Alan M. Chesney, "Two Papers by John Shaw Billings on Medical Education," *Bull. Inst. Hist. Med.*, VI (1938), p. 343. This work is an amalgamation of several of Billings's non-historical lectures.

²⁸ Larkey, "Billings," *loc. cit.*, pp. 360-376.

²⁹ Donald Fleming, *William H. Welch and the Rise of Modern Medicine*. (Baltimore:

Still during the Billings period, however, medical history in the larger Johns Hopkins community took an interesting new turn in 1889 with the opening of the hospital and the arrival of Osler. Billings, of course, was one of the members of the top-level Hopkins cabal that lured Osler away from the University of Pennsylvania. The plotters had also included President Gilman, Dean Welch, and Francis T. King, head of the hospital board. Officially, they wanted Osler for two positions, as Physician in Chief of the hospital and as Professor of the Theory and Practice of Medicine in the medical school. But it was never much of a secret that Hopkins was also getting an inspirational medical teacher along with a medical historian. And Billings, as he ended his tour as the hospital's medical advisor, was well satisfied with this arrangement.

With Osler on campus, the hospital and ultimately the medical school personnel began to get exposure to medical history and its methodology on an ongoing basis. In his clinical teaching, Osler not only introduced substantive historical illustrations into his presentations but involved his students in the process of searching for material in original medical-historical sources. At the same time, with Howard Kelly, Welch, and others, he organized the Johns Hopkins Hospital Historical Club, whose monthly meetings generated extraordinary interest among faculty and students alike.³⁰

Invited to become an honorary member of the Club, Billings went up from Washington for the meetings when he could, and sometimes he presented short papers or commentaries. On occasion, he would bring along one or more of the rare medical books that he had just acquired for his library. And with these impressive physical evidences of the past in hand, he would deliver short bibliographical descriptions of the tomes, summaries of the lives and times of the authors, and interpretations of the medical contents. Not a few members of the club, particularly those who were book collectors, are on record as having been influenced by these informal but knowledgeable presentations by Billings as much as they were by the more finished and literary historical profiles that Osler tried out on the club members.

If Billings ever completely relaxed, it was at the meetings of the historical club. He was comfortable being with Welch, Osler, and other like-minded

The Johns Hopkins University Press, 1987), pp. 194-199, 201.

³⁰ For Osler's early roles as a historian, see Charles G. Roland, "Sir William Osler," *ANB*, vol. 16 (1999), pp. 804-807; and Michael Bliss *William Osler: A life in Medicine* (Oxford: Oxford University Press, 1999), pp 164-260.

faculty members who participated. These were, of course, occasions when they all basked in the early fruits of the idealistic medical ambiance that they had been creating. Moreover, in their own ways, they took satisfaction in being surrounded by medical students at the point when the latter were beginning their attempts to illuminate the problems of current medicine through medical history.

Billings's contemporaries were probably not surprised that he and the Army Medical Department had furnished the principal models for the three medical segments of the new university. But some wondered that Billings, the career medical officer, remained satisfied with the low compensation he received in federal service. Others, to be sure, recognized the satisfaction that he had to be getting from these challenging medical and scientific activities. And most must have marveled that so many extraordinary opportunities should continue to come to him.

Chapter 4

Army Stimuli of Medical Knowledge and Change

Through no fault of builders, staff, or consultants, both the Johns Hopkins Hospital and the Hopkins medical school were forced to remain in unfinished states for various lengthy stretches after Billings had worked out the first plans for them in 1876 and 77. While he was as frustrated as anyone by these interruptions, Billings may have particularly regretted every delay in opening the medical school because of the setback it represented to America's struggle against medical ignorance. However, he could always use such lost time to good advantage for other Army projects that were intended to advance the same struggle. Among these was his participation in and encouragement of medical reform tendencies within the medical corps itself as well as in the Washington medical community. But by far the most important were his efforts to spread reform in the national medical community, to bring about a significant expansion of medical knowledge by means of an enlarged Surgeon General's Library.

Medical Reform and the Surgeon General's Library

When Billings joined the Surgeon General's Office, he found that his fellow career medical officers were particularly preoccupied with two matters, the changes brought on their department by the war, and the goings on of the medical profession. Not surprisingly, for the most part, they thought of themselves as physicians before they were scientists, sanitarians, administrators, or anything else, and they took pride in their professional status as physicians. Most had considerable experience in caring for patients, and almost all had had to pass stringent examinations to gain entrance into the Army's career medical corps. All were "allopaths", or medical regulars, and a majority of them felt it important to make allopathic medicine work better than it had; it was currently badly in need of reform.

Billings himself, even after withdrawing from medical practice near the end of the Civil War, continued to find most of his friends from among the medical regulars, particularly that segment that was actively searching for improvements in the old approaches to medicine. As such, up to 1895 anyway, he never ceased studying and learning the details of the medicine of his day, and he early gained standing as one of its authorities. He also acquired an early awareness of the information needs of the various segments of America's medical and health-related professions.¹

When he went to work in Washington, apart from his work as an administrator, Billings went to considerable pains to keep up personally with new medical practices and knowledge about diseases and therapies. He hoped that he would be aided in this by making contacts in the local medical community. As it turned out, however, the post-war capital city had relatively few of the medical institutions or associated activities that he expected sizeable communities to have. Periodically he went across town from his office with an Army colleague to observe operations or other special cases at the recently built United States Soldiers' Home. But non-federal community hospitals of Washington for some time remained few as well as typically crowded, poorly equipped, and not conducive to giving either clinical or scientific instruction. Billings made connections with some of the city's prominent physicians, among them Joseph Toner and Christopher Cox, both of whom were active in national as well as local medical and public health activities, while Toner had an unusually large private medical library.² Still, there was only a single medical school, one that thus far had few if any faculty members of sufficient reputation to attract good students. Moreover, there were no medical publishing houses, no medical journals of any standing, and little public sanitary activity except during epidemics. The quality of papers presented at sessions of both of the city's two regular medical societies was apparently so pedestrian and generally lacking in scientific interest that Billings rarely attended such meetings. Nevertheless, by 1875, along with Barnes, Crane, Woodward, and Otis, he had been elected

¹ For a short but insightful review of Billings's contributions in the context of those professions, see Samuel Haber, *The Quest for Authority and Honor in the American Professions, 1750-1900* (Chicago: The University of Chicago Press, 1991), pp. 319-341.

² For Toner, see Whitfield J. Bell, Jr., "Joseph M. Toner (1825-1896) as a Medical Historian," *Bull. Hist. Med.*, 47 (1973), pp. 1-22.

to honorary membership in one of those groups, the Medical Society of the District of Columbia.³ Moreover, over the next two decades, he became active in several of Washington's emerging medical institutions, particularly as advisor for the formation of new hospitals.

While Billings initially found little spirit of improvement or innovation in Washington's local medical community, there was generally an abundance of such sentiments in the Surgeon General's Office in the late 1860s and early '70s. The surgeons who were brought into the office were, in fact, tapped specifically for their positions because, apart from their professional competence, they retained their Civil War energies and dedication to military medical betterment. Through their reading in the postwar medical press, the army surgeons also became at least generally aware of movements for medical reform that were under way in scattered parts of the United States in such problem areas as medical education, urban sanitation, medical licensure, industrial work conditions, and hospitals.⁴ It was clear, however, that thus far no effective federal voice or institution had emerged that might encourage or focus such movements.

Meanwhile, however, the Surgeon General's agenda to elevate Army medical learning was being vigorously pursued. Both the medical museum and the Civil War history projects were developing according to plan. Equally significant was the progress that Billings had already made with the newer project of upgrading the Surgeon General's miscellaneous book collection into a true medical library. But, by the 1870s the magnitude of his project was becoming more and more evident, particularly to those who knew that, world-wide, the production of new medical and scientific literature was piling up at an exponential rate of increase.⁵

³ There is no comprehensive history of medicine in Washington. However, see Daniel S. Lamb, J. B. Nichols, et. al., *History of the Medical Society of the District of Columbia*, 2 vols (Washington: The Society, 1909 and 1947); Betty L. Plummer, "A History of Public Health in Washington, D.C., 1800-1890." Ph.D. Diss., University of Maryland, 1984; and Nancy B. Paull, *Capital Medicine, A Tradition of Excellence* (Encino, Calif.: Jostens Publishing Group, 1994).

⁴ For a brief overview of American medicine during this period, see James H. Cassedy, *Medicine in America: A Short History* (Baltimore: Johns Hopkins University Press, 1991), pp.67-76.

⁵ A trenchant inquiry into Billings's and other claims about antebellum medical

Billings's fledgling library had been given space in the former Ford's Theatre building. There it was sandwiched in between several temporarily larger operations of the Surgeon General's Office. Those activities had already begun giving the building some distinction as a post-Civil War center of military medical learning and related matters and certainly as one of Washington's more innovative medical facilities. On one floor of the former theater, volumes of the Medical and Surgical History of the war were beginning to be completed and distributed. On another floor, clerks were kept busy searching the wartime medical files for evidence to support the pension claims of America's veterans or their relatives. And, up a few flights, in the medical museum, members of the public as well as medical students were able to examine the displays of wartime medical equipment and pathological specimens, while, out of sight, staff scientists prepared new materials for exhibit and conducted research in pathology, microscopy, chemistry, photography, anthropology, and other sciences.⁶

Billings's impressive buildup of the Library between 1867 and 1895, from its unpretentious beginnings in the Ford's Theatre setting to its becoming a substantial and influential national institution there and later on the Mall, has been comprehensively examined by Wyndham Miles.⁷ Here that growth can only be summarized briefly and then considered for its role in and impact on the medicine of the late nineteenth century. Miles notes the library's early transformation from a facility that had been intended for the sole use of military medical personnel to one serving the medical

library holdings, is John B. Blake, "Billings and Before: Nineteenth Century Medical Bibliography," in John B. Blake, ed., *Centenary of Index Medicus, 1879-1979* (Bethesda, Md.: National Library of Medicine, 1980), pp. 31-52. For a dated but still challenging study of the historical growth patterns of scientific literature, see Derek DeSolla M. Price, *Little Science, Big Science* (New York: Columbia University Press, 1963).

⁶ For a contemporary description of the layout of the building, see (Joseph J. Woodward), "The Army Medical Museum at Washington," *Lippincott's Magazine of Popular Literature and Science*, March 1871, pp. 233 ff. See also Robert S. Henry, *The Armed Forces Institute of Pathology: Its First Century, 1862-1962* (Washington: Office of the Surgeon General, U.S. Army, 1964), pp. 51-71.

⁷ Wyndham B. Miles, *A History of the National Library of Medicine* (Bethesda, Md.: National Library of Medicine, 1982), pp. 15-200.

professions and citizenry as a whole. He then goes on to provide details of Billings's resourceful and aggressive acquisition campaign, conducted first within the Medical Department and then among physicians and other health professionals everywhere as well as among librarians, editors, and agents. Billings's objectives were not only to publicize the new resource among potential users but to ferret out and obtain as many medical works as possible for the collection from Americans, Europeans, and others. Miles subsequently covers such matters as Billings's self-training in the skills of the librarian, his inspired recruitment of Robert Fletcher as his deputy, and his organization with Fletcher of the two enormous pioneering finding guides to the library's collections, the *Index Catalogue* and the *Index Medicus*. Both of those guides were launched in the late 1870s and with each successive volume gained further recognition as indispensable access tools for members of the medical and health-related communities, and hence as keys to the success of the library.⁸

Equally crucial was Barnes's willingness to retain Billings for duties in the Surgeon General's office indefinitely instead of rotating him into field positions, which was the usual lot of the medical officers. By remaining in Washington, Billings ensured continuity of the Library's growth into the largest medical library in the Western Hemisphere by the mid-1870s and into the largest in the world by 1895.⁹ As a repository of the world's medical knowledge, moreover, it had begun, as much as anything else, to serve as a key marker of America's newly respectable level of medical literacy.

Among those who were essential in helping to build up the library and making it known were the individual American physicians and other health professionals from whom Billings solicited exchanges or gifts of books. In the course of this process, he came to think of these individuals as participants and collaborators whose gifts gave them a stake in the library's expansion. And many of them felt the same way. Over time he thus developed an informal personal network of contributors, exchangees, and medical influentials in all parts of the United States and elsewhere. It was a group that he rewarded by sending the individual members copies of publications of the library and of the Surgeon General's office, generally in the hope that they would support future solicitations for the library or other projects.

⁸ For Fletcher, see Estelle Brodman, "Memoir of Robert Fletcher," *Bull. Med. Libr. Assoc.*, vol. 40, no. 3 (July 1961), pp. 251-290.

⁹ Miles, *History of NLM*, pp. 85-86, 176-177.

The recipients, many of whom had had Civil War experience, and including former Confederates, welcomed these evidences of Billings's library for various reasons. For some, they marked an early stirring of federal medical initiative, of a central medical authority that could help overcome the country's deep-rooted medical provincialism. Others cheered the salutary and progressively larger intellectual influence that this Washington agency was exerting in the various communities. Access to its increasing collections of materials brought new rational viewpoints to bear upon the country's divisive and fruitless arguments over conflicting medical theories and systems, along with illumination for the ongoing debates over the etiology of disease or about therapies old and new. It also stimulated the building of new local medical libraries or the rejuvenation of older institutions and in general sparked improvement among health professionals across the country.

Billings's assignment to the Surgeon General's Library was clearly one of the most congenial and challenging opportunities that Barnes could have offered. It was one that allowed the younger man wide scope, not only for satisfying his thirsts for learning but for exercising his energies, organizational talents, and management skills. At the outset, it placed him at the head of what quickly proved to be one of the most concrete and effective initiatives of the post-Civil War period for elevating the quality of American medicine. Subsequently, it also opened up opportunities for him to participate in the planning and development of other projects of his generation that had similar aims.

Throughout Billings's Army career, people were frequently surprised to learn that Billings normally worked at the library only part-time. While he retained responsibility as the institution's Director, he left large chunks of its routine operations to the Librarian and other subordinates. This made it possible for him to work on the successive special assignments of the Surgeon General or to carry on personal research. Billings's personal preparation for these large assignments often required beefing up the library's collections in the appropriate medical areas. This done, he became the library's heaviest user, reading exhaustively first in existing holdings and eventually in the new acquisitions. Beginning in the late 1860s and continuing into the nineties, this repeated process helped Billings evolve into a many-sided expert, as authoritative in a variety of medical fields as anyone else in the Americas or elsewhere, not only in medical librarianship but in sanitation and hygiene,

microbiology, hospital design, public health administration, vital statistics, and other specialties.¹⁰

Normally, of course, the acquisition process, once set in motion, systematically brought large quantities of materials into the library on a regular basis. At an early date, Billings decided that, if the Library was worth creating, there should be few if any restrictions—whether ideological, geographical, or chronological—on the types of materials to be added to its collections. He accordingly insisted on obtaining all he could find and afford of the literature of the entire medical tradition from antiquity onward. In this decision he had the grateful concurrence of the physician-historians and collectors of his generation, among them John Stockton Hough and S. Weir Mitchell. He was likewise applauded, late in the period, by his educator friends and scientific colleagues at Johns Hopkins. These included such increasingly influential medical educators as William H. Welch, William Osler, and Howard Kelly, scientists who often drew from the old medical volumes to help their students gain historical perspective on their laboratory-based studies in the rapidly changing medical world.¹¹ However, Billings knew that the library had an even greater obligation to obtain the burgeoning medical publications and records of his own times. He thus pressed his suppliers, particularly in Europe, to search, not only for the latest monographs, but for the transactions of new medical and scientific societies, the mushrooming specialty journals, the reports of rapidly multiplying hospitals and public health agencies, the research findings of scientists at laboratories in academia and elsewhere.

As he worked and studied in the mushrooming library collections, Billings became increasingly aware that the contents of these mainly recent European medical publications reflected a remarkable pattern of energies, methodological approaches, institutional resources, intellectual innovations, and technical and scientific applications that had been coming together in many areas of medicine, often with important or even spectacular results. In fact, with other American medical innovators of his generation, he saw that the totality of this phenomenon comprised a new or previously under-exploited way of approaching and thinking about medicine. And

¹⁰ For extended elaborations of the results of this activity, see chapter 5.

¹¹ Miles, *History of NLM*, pp. 100-101, 231; and Garrison, *Billings*, pp. 209-210.

he grasped its significance as a comprehensive mid-nineteenth-century European medical revolution.¹²

Billings was not one to suggest the importing of that revolution to the American scene uncritically or in its entirety, not even the much admired German blending of laboratory, clinical, academic, and governmental ingredients. He also recognized, for instance, the abundant influences of the British. However, he recognized that, as its holdings grew, his library would inevitably nourish most of the foreign-spawned ideas and supply whatever other facts would be needed to formulate and generate an American version of the revolution. By the mid-1870s, in fact, the library's holdings incorporated a large proportion of the literature pertaining to the specifics of Europe's revolution, details that were of particular interest to health professionals who did not have the opportunity of studying in Europe.

East-Coast Collaborators in America's Medical Revolution:

The Surgeon General's Library, of course, only gradually became the full-fledged gold mine of revolutionary medical knowledge that it promised to be for the prepared mind. Accordingly, Billings expended considerable energy in the effort to increase the number of prepared minds in the American medical community. At professional meetings, his papers frequently urged adoption of the scientific mode of thinking. For him, that basically meant replacing the easy reliance on hunches and guesswork in medical practice and health investigation by approaches that were critical, experimental, and systematic. But it also meant utilizing the entire armamentarium of effective approaches that were available for medical investigation and application, making the most, for instance, of technological skills and the observing and quantifying methods of the French clinicians as well as the laboratory

¹² One of Billings's most detailed expositions of the medical revolutionary phenomenon is his 1878 "Suggestions on Medical Education," reprinted in A. M. Chesney, ed. "Two Papers by John Shaw Billings on Medical Education," *Bulletin of the Institute of the History of Medicine*, vol. 6, no. 4 (1938), pp. 313-359. Among secondary discussions of the period's medical change, see Lester S. King, *Transformations in American Medicine* (Baltimore: Johns Hopkins University Press, 1991), pp. 209-223; and Cassedy, *Medicine in America*, pp. 67-96.

methods that were steadily spreading.¹³ Some of his papers thus described his own uses of varied modes of science. In other papers, he demonstrated the importance of business-like procedures in the planning, building, and management of medical institutions and enterprises. And equally often, he continued to advertise the basic values of his library as the increasingly authoritative American source of information about the other ingredients of medical change.¹⁴

Through his network of friends and collaborators, Billings seems to have supported the reform projects of local medical communities fully as effectively as did those individuals who had just returned from medical and scientific studies in Europe. In fact, in those places, through the 1870s and '80s, key individuals began to be strongly infused with some of the Army man's enormous energies as well as to be impressed by the importance of his initiatives and the forcefulness of his organizing methods.

As a result, in combination with the impetus of other reformers, the Billings influence contributed powerfully to the late nineteenth-century emergence of a new degree of confidence, sense of well-being, and desire to move ahead on the part of a significant segment of America's regular medical profession, at least in the larger and more affluent communities. Such activists began or renewed campaigns to make their own medical society meetings more substantive and productive; to create laboratories and otherwise promote the sciences; to make the content of their professional journals more original and more critical; to establish or improve their health departments, and to give major support to the reform agitation in the medical schools.¹⁵ Moreover, strengthened or influenced by the Billings examples, they modeled some of their hospitals upon his plans for the Hopkins even

¹³ John Harley Warner, *Against the Spirit of System: The French Impulse in Nineteenth Century American Medicine* (Princeton: Princeton University Press, 1998). Warner effectively describes the considerable impact in mid-nineteenth century America of the French numerical mode of thinking scientifically about medicine, a generation before the German model emerged.

¹⁴ JSB, *A Report on the Hygiene of the United States Army*. U. S. Surgeon General's Office, Circular No. 8 (Washington: G.P.O., 1875); JSB, "On the Plans for the Johns Hopkins Hospital at Baltimore," *Medical Record* (N.Y.), vol. 12 (1877), pp. 129-133, 145-148; JSB, "Medical Bibliography," *Transactions of the Medical and Chirurgical Faculty of Maryland*, 1883, pp. 58-60.

¹⁵ See discussion in King, *Transformations*, pp. 209-223.

before that institution was completed, followed his reports on military sanitation in the interest of improving community hygiene, and began to shape the aims of their new local medical libraries after those of the Surgeon General's Library, though retaining direct access to the latter through the expanding Index Catalogue and Index Medicus. As a result, in emulating the Billings innovations, they also provided testimony of the emergence of Washington as a newly significant center of national medical activity, influence, and change.

While by no means excluding qualified individuals elsewhere, and certainly not Southerners, Billings over time developed particularly close and productive relationships with the reform-minded regular physicians and sanitarians of four other cities along the northeastern coast: Baltimore, Philadelphia, New York, and Boston. Some of those ties began with Billings's part-time assignments or consultancies. Others grew out of his negotiations for contributions to his library and out of his labors on professional committees. But most of them resulted from his need to know, to see significant examples of existing American health facilities for himself and to gather first-hand information about hospital design, ventilation, vital statistics, laboratories, and sanitary systems, for instance, for use in his own plans and works. Billings went on to maintain and enlarge his ties in these special cities through this period both because they were convenient and because he had legitimate professional reasons to travel to them in person, sometimes frequently.

Development of these ties was greatly facilitated for Billings by Washington's good rail service to the other cities. At the same time, the business functions of his trips were occasionally combined with events that were social or ceremonial in nature. There were sometimes lectures to be given, sometimes celebrations to participate in marking the completion of each others' libraries, laboratories, new medical journals, boards of health, hospitals, or other reform projects. There were official events to attend and awards to be bestowed. And, from time to time there were splendid dinners in honor of long-lived luminaries of regular medicine, events marked by the excellent wines, by the numerous toasts, and by one or more original poems. Billings enjoyed such get-togethers of these accomplished representatives of regular medical reform and learning. While he seemed to have no gift for preparing original poems, he was often called upon to give or respond to toasts.¹⁶

¹⁶ A number of programs and menus from these events are scattered through the scrapbooks and elsewhere in the Billings papers at NLM.

Billings began reaching out to kindred spirits among the Boston reformist regulars at least by 1872. At the meetings of the AMA and the APHA of that period, he quickly came under the influence of Henry I. Bowditch, whose survey of public health was a major factor in turning the younger man into a vigorous advocate of preventive medicine.¹⁷ The two men continued to share and promote each other's ideas and accomplishments, and occasionally to visit each other, until Bowditch retired from the Massachusetts State Board of Health, turning over his leadership in public health to a succession of capable successors, each of whom had his own ties with Billings.¹⁸

During the same years, in Boston, Billings developed equally close professional and personal ties with the perpetually inquisitive and forward-looking poet-physician Oliver Wendell Holmes, as well as with James Read Chadwick, Librarian of the Boston Medical Library. Holmes could have become an even earlier role model for Billings than he actually was, because of his important studies of the microscope if nothing else, but he had also built up one of the very best libraries of an American physician, a collection that he went on to contribute to the Boston Medical Library.

In the mid-1870s, Billings and Chadwick were engaged in energetic and highly profitable exchange activities to help build up the collections of both of their libraries, a process that went on at the same time that the former was also helping other officials of the Boston library with the planning of their new building. At the dedication ceremonies of the structure in December 1878, Holmes as chairman credited Billings with furnishing numerous suggestions for heating, ventilation, lighting, and space arrangement. The latter, in response, appealed to the Boston library's membership for help in gaining financial support from Congress for his own library. At the same event, Justin Winsor, the Harvard University Librarian, made certain everyone knew that Billings was the "greatest bibliographer of this or any other country."¹⁹

¹⁷ Henry I. Bowditch, *Public Hygiene in America* (Boston: Little, Brown & Co., 1877).

¹⁸ For a concise review of Bowditch's career, see John Harley Warner, "Henry Ingersoll Bowditch," *American National Biography*, vol. 3 (1999), pp. 267-269.

¹⁹ Unidentified clipping from a Boston newspaper covering the library's dedication on December 3, 1878. Microfilm of Billings scrapbooks, vol. III, in JSB papers in NYPL (NLM holding is on MS Film-25, Reel 26).

Chadwick went on to help keep Billings involved in the Boston area's regular medical affairs through the rest of the century. He and others worked out plans for the latter to give the Lowell Institute lectures in 1888. And they made sure he was invited in 1896 to attend the fiftieth anniversary celebration of ether anesthesiology at Massachusetts General Hospital. In between, Billings did a certain amount of advising, including serving a stint on the Visiting Committee for Harvard University's medical and dental schools.²⁰ He also carried on preliminary discussions with university officials and prominent physicians pertaining to the need for a university hospital. Those consultations continued fitfully into the twentieth century, when such an institution, the Peter Bent Brigham Hospital, was finally realized using Billings's plans, including his suggestions for merging existing facilities.²¹

Billings's ties with the regular medical community of Baltimore were at first few in number. This was largely because there was relatively little sign of medical innovation or awareness of the European model of reform in the city until the mid-1870s, when he himself began going to Baltimore to work on the Hopkins institutions.²² The content of his early public lectures at the University seems to have been moderately eye-opening in this respect for some of the local physicians who attended. At least, two years later, the Medical and Chirurgical Faculty of Maryland acknowledged as much by electing Billings to honorary membership. However, since no major local medical reform initiatives were immediately forthcoming, during the first few years that he was commuting to Baltimore his business remained mainly with Hopkins people. On the technical level it was with the hospital trustees, architects, and builders, while on the academic level his interchanges were with Gilman, Welch, and other members of the medical school faculty.

Billings travelled to and from Baltimore one or more times almost every week while the hospital was under construction, and somewhat less often afterward through the early 1890s. He continued to keep a severe eye on the technical functioning of the buildings, and he gave periodic lectures.

²⁰ Frederick C. Shattuck to JSB, 1/29/91 and 3/3/91, JSB papers NYPL.

²¹ JSB, correspondence and planning documents related to the Peter Bent Brigham Hospital, 1902-1908, JSB papers NYPL, Box 68 (Hospital Construction), Folder #8. See also Kenneth M. Ludmerer, *Learning to Heal: The Development of American Medical Education* (New York: Basic Books, 1985), pp. 221-222.

²² Donald Fleming, *William H. Welch and the Rise of Modern Medicine* (Baltimore: Johns Hopkins University Press, 1954), pp. 70, 77-80.

When the wards filled with patients, he sometimes went on rounds with Henry Hurd, the able hospital director, or one of the professors. He also collaborated with Hurd in preparing several publications on hospital administration and helped him establish a hospital library. Not surprisingly, the two men maintained this active collaboration long after Billings had left Hopkins and the Army.²³

In Philadelphia, a similar but larger medically related web of friendships, professional collaborations, and administrative responsibilities existed, with Billings being drawn into it as early as the Civil War years. The web was spun over time by such prominent physicians as Joseph Leidy, S. Weir Mitchell, William Pepper, Horatio Wood, and William W. Keen, all of them early advocates of scientific medicine and other forms of medical reform in the city. The ties were equally welcomed and fostered by Billings, whose persuasive arguments turned these individuals into some of the most stalwart supporters of his library.²⁴

In turn, during the late 1870s and eighties, the Philadelphia physicians, like other American professionals, tapped the resources of the Surgeon General's Library with increasing regularity; several of them got in the habit of going directly to Billings for help in expediting their book requests. Likewise, by the early eighties, Mitchell, a neurologist, and Pepper, the University of Pennsylvania's provost, had both begun consulting him, sometimes separately and sometimes together, about hospital design, planning, and organization. The spring of 1881, for instance, found all three, together with Wood, involved in the processes of working up plans for a new wing at the University of Pennsylvania Hospital to accommodate chronic heart and lung sufferers. Billings's roles in this included the examination of the preliminary plans in his Washington office, the preparation of proposals for ventilation and heating, and several trips to Philadelphia for working discussions and site visits with all concerned, including the architect and the building committee.²⁵

All in all, the consonance of Billings's reformist inclinations and contributions with those of the Philadelphia regular reform elite was such

²³ The friendly correspondence between Billings and Hurd between 1891 and 1911 deals with many aspects of hospital operation. See JSB papers NYPL.

²⁴ Chapman, *Order out of Chaos*, pp. 257-274.

²⁵ S. Weir Mitchell to JSB, 1/28/1875 and 1/7/1875; and William Pepper to JSB, 3/4/1881, 4/6/1881, and 3/31/1881; all in JSB papers NYPL.

that their ties continued to expand by mutual agreement. During the eighties, Pepper in particular, acknowledging the other man's growing value to him, to the University of Pennsylvania, and to medical reformers in Philadelphia, continued to propose new things for Billings to do or ways to keep him in their circle. In early 1884, for instance, he named Billings to be the University's representative at the 300th anniversary of the establishment of the University of Edinburgh. Late that same year, he invited Billings to dinner "to meet Osler and some good fellows," and to stay overnight afterward.²⁶

Through the rest of the decade, Billings and Pepper had many more meetings, often including other individuals. Prominently, their discussions dealt with the question of what the University of Pennsylvania needed to do to match health reforms that were being introduced elsewhere in academia. Pepper was well aware of the comprehensive innovations in medical education, hospital design and care, health-related research, and other areas that Billings had formulated and helped introduce at Johns Hopkins and that Charles Eliot had begun at Harvard.²⁷ By 1889, Pepper had worked out a partial plan for change in which Billings was to be the central figure and which the latter, after obtaining the necessary permission from the Surgeon General, was happy to accept. This provided for Billings to become Director of a new Department or Institute of Hygiene as well as to design and build its laboratory building, to serve as Professor of Hygiene in the medical school, and to be Director of the university hospital. As agreed, his work in these posts remained on a part-time basis until 1895, when he resigned from the Army, disengaged himself from most of his obligations to other institutions, and took up residence in Philadelphia.²⁸

Later that year, members of the Philadelphia medical community, jubilant from their success in luring Billings to their city, organized a lavish

²⁶ Pepper to JSB, 3/29/1884, and 11/4/1884, JSB papers NYPL. Osler had been borrowing from Billings's library before he moved to Philadelphia from Canada.

²⁷ As early as 1878 Billings sent Pepper a published version of his Hopkins lectures on medical education. Thanking him, the latter replied: "Your plan [is] just what our country needs and with least chance of getting elsewhere." Pepper to JSB, 6/21/1878, JSB papers NYPL.

²⁸ Further details of Billings's hygiene activities at the University are discussed in chapter 5.

testimonial dinner for him, one which included presenting him with a huge purse. The speakers—including Osler, Chadwick, Abraham Jacobi, and Mitchell—predictably came from medicine's improving nuclei in the large northeastern cities and vied with each other to praise his stimuli to American medical reform, particularly those growing out of the Surgeon General's Library and the Index Catalogue.²⁹

As early as 1879, the regular medical profession of New York City also had organized a number of extraordinarily enthusiastic demonstrations of its collective belief in the importance of Billings's innovations of the previous decade. Late that year, the New York Medical Society elected him to honorary membership and made him the main speaker for their December meeting. The Medical Society of the County of New York also made him an honorary member. In supporting that nomination, the pediatrician Abraham Jacobi cited four of the main Billings accomplishments to date: the development of the Surgeon General's Library; his investigations of hygiene and sanitation; his designs of the Johns Hopkins Hospital; and, most recently, his success in gaining Congressional approval of America's first federal public health body.³⁰ Jacobi then urged other American physicians to give Billings the recognition he deserved before the Europeans beat them to it.

Tributes in much the same vein continued in October at the dedication of the new library hall at the New York Academy of Medicine. The Academy's President, Benjamin Fordyce Barker, an obstetrician and pediatrician, addressed the members at some length. To him, Billings's achievements were fundamental contributions to the advancement of American medicine, and he marvelled that this one unusual man of "ability and genius", though still barely 40, should already have accomplished "so much, stimulating, swaying, and educating the whole medical mind of the country." Going on, Barker hoped that the Billings examples would serve as stimuli to comparable initiatives by members of the Academy and other New York physicians.³¹

²⁹ For an account of the dinner and of Billings's departure from Philadelphia soon afterward, see Garrison, *Billings*, pp. 282-287. See also chapter 9 of this book.

³⁰ Medical Society of the County of New York, *Minutes*, September 22, 1879, in scrapbook, vol III, JSB papers NYPL (NLM copy is on MS Film-25, Reel 56). I examine the National Board of Health in chapter six.

³¹ New York Academy of Medicine, *Transactions*, 1879; in JSB Clippings scrapbook, Vol. III, JSB papers NYPL (NLM copy, MS Film-25, reel 56).

During this period, Billings developed close ties with several individual members of the New York medical profession. He and George F. Shrady, editor of the *Medical Record*, swapped favors throughout most of the seventies and beyond. Billings supplied the other man with news of the Washington scene, while Shrady went out of his way to write editorials in support of the Index Catalogue and other Billings projects.³² With Barker, by contrast, Billings developed a much more personal friendship, one that nearly matched his connections with Mitchell, Holmes, and Henry I. Bowditch in warmth. In the early eighties, the two men supported each other as travelling companions to two international medical events in Great Britain. Barker also invited the other man to stay with him and his family when Billings came to New York on business, rather than leaving him to go to a hotel or club. To be sure, other New Yorkers (as well as physicians elsewhere) were similarly hospitable, including the clinician and pathologist, Austin Flint, Sr. On one such visit with Flint in 1884, Billings's business took him to the Bellevue Hospital Medical School, where he talked with the young pathologist William H. Welch in his laboratory and sat in on one of his lectures. That evening, back at Flint's house, Billings asked his host for his opinion of Welch, but he never revealed to Flint that he and Daniel Coit Gilman currently had Welch under consideration for an appointment to the Johns Hopkins University Medical School.³³

In many ways the most valuable of Billings's medical colleagues in New York was Abraham Jacobi. Jacobi was a strong if sometimes selective advocate of modern scientific medicine. He was also a personal friend who saw eye to eye with the other on many medical issues, and was a man of action who provided support for Billings's innovations. The latter also looked both to Jacobi and his wife, Mary Putnam Jacobi, for critical comments on new ideas and projects.

Not least in importance, Jacobi used his influence to help keep Billings prominently in the collective eye of the New York regular medical profession. One way that he did this was literally to place the latter at or near appropriate podiums. In the spring of 1883, for instance, Billings was one of the out-of-town notables chosen to grace the head table at the legendary dinner for Oliver Wendell Holmes that the profession put on at Delmonico's Restaurant. Two years later, he was placed on the platform of the New York Academy

³² See Billings's correspondence with Shrady, JSB papers NYPL.

³³ Quoted in the Flexners' *Welch*, pp. 127-128.

of Medicine meeting at which Barker turned over the presidential gavel to Jacobi, and he appeared there again at the Academy's 1887 "Anniversary meeting". Subsequently, with Mitchell of Philadelphia and Reginald Fitz of Boston, Billings gave one of the invited addresses at the formal opening of the Academy's new building.

In 1881, partly on the recommendation of several of the New York regulars as well as of others around the country, Billings was invited to present one of the keynote addresses at the London meetings of the Seventh International Medical Congress. The invitation was rightly seen as a sign of the new status of American medicine, and Billings was appropriately the first American to be recognized by such a body. With him on the program were five of Europe's most eminent physicians and medical scientists: Richard von Volkmann of Halle, Louis Pasteur and Maurice Raynaud of Paris, Rudolf Virchow of Berlin, and Thomas H. Huxley of London.

Carleton Chapman has provided details of the extensive social and ceremonial phases of this event, of Billings's enthusiastically received ninety minute address, and of his European travels before and after it.³⁴ The address was in essence a commentary on the medical significance of the literature collection that Billings had accumulated during the past dozen or so years for the Surgeon General's Library. It acknowledged his intellectual debt to numerous medical authors, particularly European, for things he had learned from their writings. And, as he spoke, he noted that many of the authors of those books and articles were in his audience. The address was thus, on the one hand, a testimony to the breadth and depth of Europe's medical revolution, while on the other hand, it touched on some of the ways in which the Americans were beginning to adopt portions of the revolution for themselves.³⁵

Billings's extraordinary reception in London solidified his position near or at the top of his profession as one of America's foremost spokesmen for and interpreter of scientific medicine as well as one of its most persistent and effective workers for the elevation of American medicine. Back in the United States, the cumulation of prestige gave him added influence in dealing with book dealers and persuading national medical organizations to hold meetings at the library and museum. It also proved invaluable every second year in his

³⁴ Chapman, *Order out of Chaos*, pp. 198-214.

³⁵ JSB, "Our Medical Literature," in 7th International Medical Congress, *Transactions* (London: The Congress, 1881), vol. I, pp. 54-70.

attempts to get the medical profession and other health professionals to push for Congressional support of the library's operating budgets, especially for its publications. And it was still more timely for Billings's strenuous campaign during the early eighties to get the professionals to lobby Congress for a new library and museum building. The favorable outcome of this campaign, and the building's excellent ultimate location in the heart of Washington, was thus a major success for organized medicine as well as for the Surgeon General's Office, the Library, and Billings himself.³⁶ Moreover, on the practical side, it also afforded Billings with the occasion to effect a substantial updating of the programs and displays of the Museum.

Revitalizing the Army Medical Museum

At the end of 1883, a new Army Surgeon General, Robert Murray, as one of his first official acts, consolidated the Surgeon General's Library and the Army Medical Museum into a single administrative unit to be known as the Museum and Library Division of the Surgeon General's Office. To head the division, he selected Billings, naming him Curator of the Museum as well as Librarian. This action gave the latter control over the Medical Department's principal scientific unit and as such enhanced his position in the top echelon of the Department's professional pecking order.³⁷ Billings's new duties, however, did not include any responsibility for the completion of the Medical and Surgical History project. That task remained in the hands of Surgeon Charles Smart, who saw it to its publication in 1888.

Murray's changes were key steps in an attempt to protect and strengthen the scientific programs of the Surgeon General's Office at a highly critical and even threatening stage in their history to date. Two developments had led to a gradually intensifying sense of urgency in the office between 1880 and 1883. One of these was the rapidly deteriorating condition of

³⁶ See Miles, *National Library of Medicine*, pp. 141-174. For the highly negative sequel to these developments, see chapter nine of the present volume.

³⁷ Billings's biographers in the main have virtually ignored his twelve year stint with the Museum. Historians of the Museum, however, have provided important accounts of that era. A particularly well-informed treatment that focuses extensively on Billings is Adrienne Noe and George S. M. Cowan, "Microscopy and the Army Medical Museum," *Caduceus*, Vol. 2 (summer 1986), pp. 1-36. See also Henry, *Armed Forces Institute*, pp. 73-89.

Ford's Theatre, the building that housed both the museum and the library as well as several other units of the office. By that time, the structure had become grossly over-loaded with heavy equipment, displays, books, files, and personnel, while its walls were developing large cracks and otherwise showing unsettling signs of decay and possible collapse. Besides, there was no space left for expansion, especially of the Library.

By 1880 Billings, working with others, had gained Barnes's approval of a new building. Over the next two years, the two men planned the specifics of such a structure and began searching for firm support from the Secretary of War, concerned congressmen, and influential professionals. At that point, however, a second development, the loss of three of the principal long-time staff members of the Surgeon General's Office, began to seriously disrupt this search as well as to threaten the continuities of the Office's scientific programs. George Otis, one of the museum's co-curators as well as an editor of the *Medical and Surgical History*, died in 1881. Barnes himself had to retire for age that same year, while by 1882 Woodward's health had failed to an extent that incapacitated him for performing further duties or research prior to his death in 1884.³⁸

Billings's designation as head of the new Division was a natural in several respects. First of all, he had a relatively light work load at that particular time and was known for his willingness to take on new tasks. Moreover, with his long service in the Surgeon General's Office, he had considerable familiarity already with its scientific activities, while in most other respects he was as well as or better qualified than any other possible candidate in the Medical Department. He also by then enjoyed extensive professional standing both in and outside of the Department.

The position had certain clear-cut duties and responsibilities. Billings was, of course, expected to continue his activities with the Library as usual. Moreover, he was formally named also to continue as coordinator of the planning, construction, and moving phases of the new building. These came to a climax in the fall and winter of 1887 when the museum and library reopened to the public at their new site near the Smithsonian Institution on the Mall.

With respect to the Museum, Murray may have initially anticipated that Billings would only have time enough left to cope with the routine administrative tasks and curatorial functions that were already in place.

³⁸ For details, see Henry, *Armed Forces Institute*, pp. 68-81

However, from the start, the latter determined to exercise full control over the agency and had no hesitancy about introducing major ideas of his own. These translated into a series of innovations that substantially changed the emphasis of the institution's work as well as its image, chiefly by introducing exhibits and programs that focused on the innovations and sometimes the excitements of contemporary science and explained their workings. Billings made no secret, for instance, of his intention to balance and supplement the original displays of Civil War-related specimens by adding up-to-date exhibitions that would have greater immediate value and interest for a new generation of physicians and scientists.

Even before Congress appropriated money for the new building, Billings began thinking about possible staffing changes that might expedite his plans for the museum. While a nucleus of the current professionals such as the pathologist Daniel S. Lamb could be kept on, his mind leaped ahead to the possibility of having one of the "younger men of our Corps" assigned to the museum every year for six or more months as a sort of interne "in order that they may see what is going on and be prepared to give intelligent assistance in the work."³⁹ Meanwhile, he also began talking with Washington Matthews, S. G. Cowdrey, and other relatively senior medical officers with scientific interests who he hoped might consider applying for positions in the museum.

This led to the problem of what to do about Billings's friend, the microbiologist George Sternberg, who, with Woodward out of the picture, was far and away the Army's most capable and accomplished laboratory research scientist. Exiled at remote southern and western forts most of the time that Billings was in Washington, Sternberg had been perennially frustrated by the limited facilities that such forts afforded for research. By the 1880s, understandably, he was particularly yearning for an assignment back East.

When he first heard about Woodward's disability, Sternberg wrote immediately, appealing particularly to Billings as one who "appreciate(s) the value of etiological studies and of the experimental method" to support his candidacy if or when a replacement was to be named.⁴⁰ A good many months later, after Billings himself was named to succeed Woodward as curator, he brought Sternberg up to date with a partly apologetic letter that could not have left the latter happy. First of all, he explained that he was not

³⁹ JSB to Washington Matthews, 2/5/1884, JSB papers NLM.

⁴⁰ Sternberg to JSB, 5/29/1882, Sternberg papers NLM.

planning to recruit for a research position such as Woodward had enjoyed and Sternberg evidently wanted. In fact, he did not even intend to use the museum facilities very heavily to support his own research: "I shall make it my object to stimulate and give opportunities for other men to work in connection with the Museum rather than try to work or write on details myself." "I am sorry," he concluded, "that it has not been possible to meet your wishes by placing you in charge of this department [i.e. microscopy], but I hope I shall be able to help you to a part at least of what you want, after a little."⁴¹

While Sternberg never obtained a post in the Museum, he and Billings managed to remain on friendly terms and to keep each other abreast of their career developments. The Surgeon General did bring Sternberg back East later in 1884, assigning him to a post near Baltimore. That location permitted the latter to utilize research facilities at Johns Hopkins, to participate in several international yellow fever investigations, and to strengthen his name as America's foremost bacteriologist before being named Surgeon General in 1893. While considering the establishment of an Army Medical School that year as one of his first acts in that post, Sternberg knew that he had the full concurrence of Billings in the project and went ahead to include the latter on the school's first faculty.⁴²

The nearly four year period between Billings's appointment as Museum Curator and the completion of the new building allowed substantial time, both for implementing the various changes and for firming up the professional staff, both the carryovers and a few new ones. Accordingly, the museum that opened to the public in the new building in the spring of 1888 was itself new in important ways. Above all, its exhibits now presented a wealth of tangible demonstrations, verifying and enlarging on the literary evidence in the adjoining medical library that formed the core of the new knowledge constituting scientific medicine. The new displays were, of course, central parts of an expanded teaching function aimed at explaining key segments of that knowledge. Much attention was given to the display of specimens that illustrated recent findings everywhere in human anatomy and pathology, while another section of the museum was devoted to the presentation of specimens of diseases and injuries that were drawn from the Army's experience, some to be sure from the Civil War but others from

⁴¹ JSB to Sternberg, 1/15/1884, Sternberg papers NLM.

⁴² See the short account of the school in Chapter 5.

more recent years. Related presentations included samples of the medical instruments and equipment, the hospitals, the modes of transporting the sick, and other objects developed for the Army.⁴³

Billings also gave considerable attention to the museum's large stores of material related to human osteology, particularly craniology. His plan was to use those specimens to illustrate both the ethnological differences and the similarities of the various "native races of America." Thus, anthropometry, or study of the "real or supposed structural differences in man according to race," was arranged to be studied and displayed in the medical museum, "while specimens illustrating manners and customs, implements, weapons, clothing, pottery, etc" were left to the nearby National Museum.⁴⁴ Billings obtained Surgeon Washington Matthews, one of America's most knowledgeable specialists, to supervise the craniological arrangements and studies during the planning period, but he could not persuade him to remain with the museum permanently.⁴⁵

Billings regarded it as imperative for all sections of the museum to display and use "the latest methods, the newest apparatus, etc.," both to show visitors how modern science was being done as well as to eventually allow staff members and other scientists to do some experimentation. By 1888, a separate room had been provided for anthropological equipment that was intended to provide the nucleus of a complete laboratory, mainly for educational purposes. Billings, among other things, also looked forward to the day when that facility might emulate Francis Galton's London laboratory in offering to make standard anthropometric tests and measurements on visitors.⁴⁶

⁴³ Soon after its reopening, Billings discussed the new features of the museum in detail in his presidential address before the Congress of American Physicians and Surgeons: JSB, "Medical Museums, with special reference to the Army Medical Museum at Washington," *Medical News*, Vol. 53 (1888), pp. 309-316, or reprint, pp. 1-43. See also a reporter's earlier review in *Medical News*, Vol. 49 (1886), pp. 330 ff; and the discussion in Henry, *Armed Forces Institute*, pp. 73-88.

⁴⁴ JSB, "Medical Museums," *loc. cit.*, reprint, pp. 22-23.

⁴⁵ JSB to Matthews, 3/12/1884 and 5/5/1884, both in JSB papers NLM. For a recent study of Matthews' scientific career, see Katherine S. Halpern and Susan B. McGreevy, ed., *Washington Matthews: Studies of Navajo Culture, 1880-1894* (Albuquerque: University of New Mexico Press, 1997).

⁴⁶ JSB, "Medical Museums," *loc. cit.*, reprint, p. 23.

Meanwhile, Billings was able to purchase a variety of instruments, including one for psychophysical research.⁴⁷ Among these, in 1888 he arranged with the young psychologist James McKeen Cattell, who was then working with Wilhelm Wundt in Leipzig, to order a German electric chronoscope. Cattell volunteered to set the apparatus up in Washington after he returned to the United States the following summer.⁴⁸

Some of Billings's most conspicuous innovations in the museum were in the microscopy section. Soon after becoming curator, he arranged with a London agent, John Mayall, to start purchasing microscopes for the museum's tiny historical collection, one which he hoped would eventually include "an example of every different form" of the instrument ever built. By the year the museum opened, over one hundred and forty instruments shipped by Mayall had been put on display.⁴⁹

Also prominent in the displays of the microscopy section were over 11,000 specimens, together with photomicrographs, that had been collected during the previous twenty years from the various fields of microscopic research. Thinking apparently of an interest of his former colleague, Woodward, Billings attempted to enhance those holdings by purchasing one of Friedrich A. Nobert's most advanced test plates, a ruling device for assessing the performance of the highest-powered objective lenses. However, the asking price proved to be more than the museum's budget could afford.⁵⁰

In any case, he was already spending fairly liberally on instruments and other laboratory equipment to illustrate the applied aspects of microscopic research, including the processes. He was especially concerned with demonstrating their recent uses in bacteriology to identify the causative

⁴⁷ Daniel S. Lamb recorded the accessioning of many of them, in his "A History of the United States Army Medical Museum 1863 to 1917," typed manuscript at NLM.

⁴⁸ Cattell to JSB, 1/3/1885, 3/13/1885, and 7/3/1885, all in JSB papers NLM.

⁴⁹ JSB, "Medical Museums," *loc. cit.*, reprint, p. 20; and John Mayall, Jr. to the Surgeon General, U.S. Army, 3/25/1884, in JSB papers NLM. See also the rich account in Noe and Cowan, "Microscopy and the Army Medical Museum," *loc. cit.*, pp. 1-36; together with Henry, *Armed Forces Institute*, p. 85; and James L. Hansen, et. al., *The Billings Microscope Collection*, 2d. Ed. (Washington: Armed Forces Institute of Pathology, 1974), *passim*.

⁵⁰ John Mayall, Jr. to JSB, 12/27/1884, JSB papers NLM.

organisms of particular infectious diseases as well as to develop means to cure, inhibit or prevent such diseases. Early in 1884, for instance, Billings had requested scientific acquaintances in the United States and Europe to furnish the museum with specimens of those disease-related microorganisms that were already known, together with proved preventatives, sera or vaccines that had been developed. Moreover, soon after Koch's research methods became known in the United States, the museum obtained a full set of the German scientist's famous "culture apparatus" as well as related research instruments that he had been using.⁵¹

In the process of obtaining such materials and instruments, Billings took on an occasional service function for the Museum's correspondents in the research community. He used his contacts, for instance, to obtain specimens of trichinous pork for research purposes and to verify a case of lead poisoning caused by canned corn, while he assigned staff members to make chemical tests of water, disinfectants, or rags, and when possible he filled requests for microbes or sera from the Museum's own supplies. Late in 1890, with the arrival of news about Koch's introduction of tuberculin as an alleged cure for tuberculosis, Billings immediately sought to obtain some of the "lymph" from Germany. When Koch himself sent off a supply, Billings in turn forwarded portions to his close acquaintances, first of all to Welch at Hopkins, who in turn passed it on to Osler and Halsted for actual clinical testing. Later, when the museum's supply of the lymph ran low, he advised investigators, such as Saranac Lake's Edward Trudeau, to apply directly to Koch's aides for what was needed, while he quickly placed another order for the museum.⁵²

Several months later, as criticisms of tuberculin mounted in the scientific periodicals, Billings wrote Koch that the army museum had distributed the lymph "widely to hospitals and to medical officers of our army," for testing. He also reported having made the tests on a few patients himself. Though the American results, including his own, had so far been mixed, Billings told Koch that he himself remained "as fully convinced of the importance and value of your work on the tuberculin as ever." He assured him, moreover,

⁵¹ JSB, "Medical Museums," *loc. cit.*, p. 24; JSB to F. H. Formad, 2/25/1884 and A. Pearce Gould to JSB, 6/3/1884, both in JSB papers, NLM.

⁵² William Osler, "Preliminary Report on Koch's Lymph," *Medical News* (Phila), Vol. 57(1890), p. 644; E. L. Trudeau to JSB, 12/14/1890, JSB papers NLM.

that American scientists generally understood that Koch had been persuaded to make his first optimistic announcements about tuberculin "before you were ready and much against your will." The Washington man closed by reiterating his personal friendship, urging Koch to pay a visit to the United States, and informing him that "I have a room in my house always ready for you."⁵³

Through this period Billings remained a persistent advocate of the creation and spread of research laboratories in the United States, particularly those devoted to hygiene and microbiology. His lectures continued to emphasize the essential central roles that they, together with registration systems, played in public health work, i.e. for ferreting out and accumulating accurate knowledge of the causes of death and distribution of diseases. Accordingly, if America was to catch up with Europe in contributing to the bacteriological age, he urged, it was important that its large communities should give every encouragement to the building of such laboratories.⁵⁴

Meanwhile, from the museum and library, Billings provided his readers and correspondents with background literature and reports about laboratories. In the early years, he had suggested that American physicians prepare themselves as health scientists by taking study visits to the pioneer European research institutions. By the mid-1880s he was also directing the development of small model laboratories for the educational programs of several units of the museum. However, he resisted any suggestion of developing a substantial medical research facility in connection with the museum. At the same time, Billings continued to nurture a vision of organizing such a facility somewhere, perhaps along the lines that he and Curtis had projected in 1869. Writing to a potential contributor in 1884, he touched on some aspects of the vision: "I do take a very great interest in researches into the etiology of disease, and if I could lay hands on half a million of dollars to build and endow a laboratory such as I wish I believe it would be the best investment that ever was made. It would not do, however, to have it a government laboratory."⁵⁵

⁵³ JSB to Koch, 6/30/1891, JSB papers NYPL.

⁵⁴ For a late statement of this belief, see JSB, *Public Health and Municipal Government* (Philadelphia: American Academy of Political and Social Science, 1891), (Supplement to the Academy's *Annals* for 1891, offprint, pp. 20-23).

⁵⁵ JSB, draft of letter to Mrs. Thomas P. Plunkett, 1/3/1884, JSB papers NLM. His opposition to government financing of such establishments was likely

It was thus no accident that, at almost the same time, Billings was beginning the discussions with his Philadelphia associates that eventually pinned down the necessary resources for building a non-governmental laboratory in that city. In fact, even as he promoted laboratories, he continued to welcome the abundant opportunities to design and build other kinds of urban buildings, along with the challenge to make them hygienically liveable.

largely prompted by the extreme difficulties he already experienced on a regular basis in obtaining adequate legislative appropriations for the continuance of the *Index Catalogue* and of *Index Medicus* as well as for the Surgeon General's Library itself.

Chapter 5

Ventilation Technology, Sanitary Politics, and Professionalism

While Billings became particularly associated in some circles with the spread of laboratory science and new medical knowledge generally and science-related health measures, he never got away permanently from his interest in some of the older public health problems and activities. In fact, the name he gained from his applications of science to hospitals was sufficient in itself not only to bring him further hospital commissions but numerous requests to plan other kinds of buildings. Through them his expertise in ventilation helped give him ever larger authority in the public health world.

The Surgeon General himself from time to time continued to loan Billings out to apply his expertise in ventilation to practical health problems of other government agencies or branches. At the same time, the latter involved himself increasingly in programs of the national public health professional groups. In such meetings and discussions, he began to carve out an expansive role as planner for the field, specifically as formulator of late 19th century public health priorities. Pursuing one of these priorities with particular vigor, he emerged as a pioneer academic instructor in the field, albeit as one who spread his energies all too thinly.

Habitually relying on the informational riches of the Surgeon-General's library to buttress such undertakings, Billings welcomed the occasional opportunities to resume his activity in practical sanitation while he also at times acted as a public health pundit or philosopher. In fact, by continuing to do both, he enlarged his understanding of the currents of change in nineteenth century medicine, science, and technology as they impacted on sanitation and public health. With that understanding, he went on to become one of America's key interpreters of those changes, a valued guide for public

health officials through the thickets of postwar debate over disease theories, sanitary measures, and scientific methods, old and new. And, in this role as guide, undertaken during lulls in his administrative duties, Billings made it his business to periodically reevaluate and restate the definitions of hygiene, sanitation, and public health.

Cleansing the United States Capitol—Expert Boards and the Congress

In the spring of 1876, Representative Casey Young, on behalf of the House of Representatives' Sub-Committee on Public Buildings and Grounds, wrote Surgeon-General Barnes for advice in dealing with chronic ventilation problems in the cavernous hall of the House. Ever since its design and construction some twenty years earlier under the direction of the Army engineer Montgomery Meigs, this new area of the Capitol building had been repeatedly criticized for serious inadequacies in its ventilation.¹ But successive attempts to improve the facilities had met with little if any success over the years. Learning, presumably through the Capitol architect, of Billings's innovative ventilation for the Barnes Hospital, Young and his committee hoped that the latter's expertise could be enlisted to help end the House's long frustration by showing the way to more effective corrective measures. Barnes promptly made him available.

Billings's first contribution to the Sub-Committee was to prepare an outline of his preliminary view of the problems and how they might be approached. With that guidance, the sub-committee then created an *ad hoc* board of "United States Officers" to assess the situation fully and undertake the necessary improvements. Named the Capitol Ventilation Board, it became one of several early *ad hoc* bodies of experts established by Congress to deal with limited sanitary problems without creating any kind of permanent federal health agency.

The Board brought together a prominent segment of Washington's architectural and scientific talent. Included were the Smithsonian Institution's patriarch, Joseph Henry, who was named as its President, and four others: the architect of the Capitol, Edward Clark; Lt. Col. Thomas Casey of the

¹ Meigs is known to have given much personal attention to the Capitol's ventilation. See Charles Dudley Rhodes, "Montgomery Cunningham Meigs," *Dictionary of American Biography*, Vol. VI, Part 2 (1964), pp. 507-508.

Corps of Engineers; Franz Schumann, supervisory architect of the Treasury; and Billings. The latter, who was the only physician in the group and, with Schumann, one of two members with special competence in ventilation, was named Secretary of the Board and was tacitly accepted by the others as the effective manager of the investigation.²

In April 1876, this body began considering the interior state of the Capitol building even as Frederick Law Olmsted and his landscapers were working at beautifying the exterior grounds. After a few weeks of inspections, the Board issued two preliminary reports that summarized the existing problems, suggested several temporary measures for relieving them, and asked for a modest appropriation to carry them out.

The Washington newspapers, obtaining the reports, quickly published details of what seemed to be the matter, sometimes using them for political purposes. One of the Republican-leaning organs, the *Washington Chronicle*, accurately reported that for years there had been complaints of uncomfortable drafts circulating unchecked throughout the hall. More vaguely, it observed that there had been much sickness among the congressmen, caused allegedly by “deadly gases descending to the floor of the House from the kitchen restaurant, the subterranean vaults, and dingy passages of the basement.” The account maintained that, because of those conditions, in the current session of Congress “more than ten percent of the members were confined to their rooms with colds and pneumonia,” while other lawmakers suffered different complaints. The *Chronicle’s* writer went on to accuse Clark, the Architect of the Capitol, who was a Democrat, of having wasted large sums of money between 1870 and 1874 on poorly conceived attempts to improve the ventilation. And he hoped that the new board would be more successful, particularly because James G. Blaine was among the ill representatives. Blaine, it reminded its readers, “is the Henry Clay of the Republican party today, and it [the party] cannot well afford to lose his valuable services at this particular time through the gross stupidity of the Architect of the Capitol.”³

² “Ventilation of the Hall of the House,” U. S. House of Representatives, Select Committee on Ventilation, *Report*, Feb. 4, 1878, (45th Congress, 2d Session, Report No. 119); “Ventilation of the Hall of the House of Representatives,” U. S. House of Representatives, Select Committee on Ventilation, *Report*, Feb. 21, 1879, (45th Congress, 3d Session, Report No. 116).

³ *Washington Chronicle*, June 24, 1876.

Galvanized by the newspapers and by their own colleagues, the members of the congressional subcommittee had little doubt about how to proceed. In keeping with a popular pre-bacteriological-age concept, it seemed evident that the Capitol was a classic case of a sick building. Accordingly, little seemed needed other than to have their expert board get started on repairing the assumed ills of the ventilation system.

As an expert who believed in the probable truth of the germ theory of disease, Billings knew that a good deal more investigation was needed before the board could take any other action. He noted that the alleged health problems of the Capitol building remained vague and unsubstantiated. Certainly the problems were not of the same kind or magnitude as the deadly infections that sometimes ran rampant through the large urban hospitals of the day. Moreover, no congressional deaths were suspected to have occurred as a result of odors or other noxious emanations from the fabric of the building. Nevertheless, acting as an *ad hoc* health officer, Billings saw that the situation had to be regarded seriously, at least for political reasons. He thus made it part of his business to educate the congressmen to some extent, not by flaunting his own beliefs in the germ causation of disease but by making an exhaustive series of tests, which were really demonstrations, of the various elements blamed by anti-contagionists as likely causes, tests that concluded by effectively rejecting those hypotheses. Besides, the panel had a good deal of technical modification and chemical analysis to do just to make the building comfortable for working in.

In the fall of 1876, to determine the effectiveness of various ventilation and heating systems, members of the Board of Experts made first-hand inspections of selected large buildings elsewhere. Several visited American structures, while Billings covered western Europe. This trip, Billings's first to Europe, was already planned as a fact-finding expedition in connection with his project to design the Johns Hopkins Hospital, but he easily rearranged the schedule to allow for inspections of some of the great non-medical structures of the continent as well as of its hospitals and medical schools. The two-month trip included, in fact, visits to an assortment of buildings, interviews with building engineers, searches for epidemiological histories of the structures, and the collection of architectural plans and specifications. Billings also fitted a considerable amount of other business into his trip between the inspections: appointments with booksellers on behalf of the Surgeon-General's library and with instrument makers for his Army medical colleagues; visits to libraries as well as health and registry offices; dinners with physicians and scientists whom he had met earlier, among them Huxley

and Lister in England; and stops at a few laboratories. He apparently did not get to Munich's Institute of Hygiene even though he had a letter of introduction to Pettenkofer.⁴

When Billings returned to Washington, he turned numerous building plans and systems specifications over to the rest of the board, along with his analyses of them. In his mind, the buildings with the most satisfactory ventilation and heating arrangements were the English houses of Parliament and the Vienna grand opera house, though there were useful features in others also.

Following this phase of fact-finding, the board resumed its frequent meetings and extensive tests, continuing them through the remainder of the term of the 45th Congress, to the end of 1877. A large proportion of these meetings were held at the Army Medical Museum in downtown Washington, where Billings and his army colleagues could provide laboratory, clerical, and other facilities. At the Museum sessions, the board went over the numerous reports, examined equipment specifications, prepared calculations of space and airflow, placed orders for anemometers and other measurement devices, and studied the results of experiments made for them by outside specialists, among them the New York architect Carl Pfeiffer. Much of their scrutiny focused on the chemical composition of the air in the Capitol and the mechanical performance of blowers and other equipment.

Fairly early in 1877 the board came to the conclusion that no major changes would be needed, particularly no replacement of the building's existing ventilation system. For the rest of that congressional term, then, and much of the following term, the members' time was mainly spent in supervising a host of lesser changes, analyses, and adjustments: installing screens in front of ventilation openings; modifying the direction and rates of air circulation; changing the location and size of ducts; improving temperature controls; and so on.⁵ Occasionally compromises had to be worked out. In

⁴ On this trip, Billings was accompanied by Dr. Ezra M. Hunt, the New Jersey sanitarian, who was then President of the AMA's section of public hygiene. The two visited some nineteen cities in seven different countries. Billings's detailed report of January 16, 1877 on his inspections of hospitals and medical schools was published in Johns Hopkins Hospital, *Reports and Papers relating to Construction and Organization*, No. 3 (Baltimore: The Hospital, 1877).

⁵ House reports of Feb. 4, 1878 and Feb. 21, 1879 on "Ventilation of the House." (See note 2). See also JSB manuscript, "Minutes of the Board of

one case, Frederick Law Olmsted and his landscaping associates objected that the location of a large air intake duct that was proposed for the exterior of the building would spoil the aesthetic appearance of that portion of the Capitol's grounds. Billings, though not particularly happy with the request, agreed to find another location.⁶

At the end of 1879, Billings and his fellow experts assembled a voluminous final report to the House Subcommittee. It essentially confirmed that the House chamber in itself was basically healthy, with no "deadly gases" circulating in or near it. And it provided abundant details of the technological changes that had been made to reduce drafts and raise the chamber's comfort level. The House and its ventilation committee were clearly well pleased with these results, as were the ailing congressmen, the press, and other Washington individuals. In turn, throughout the project, Billings and the other Board members were happy with the respect that Congress had displayed for their professional authority as individuals as well as for the Board's consistent use of scientific methods.

The same respect for science, however, was not demonstrated by a subsequent Congressional committee that Billings advised. Between 1878 and 1884 the ventilation board's report had been widely circulated among America's architects, builders, and manufacturers of ventilating and heating equipment. As the record of a major late nineteenth century investigation of ventilation, the document provided valuable information to such individuals. Eventually, however, certain of these individuals, out of self-interest, re-raised with their congressmen some of the old alarms about the alleged poor ventilation and unhealthiness of the Capitol. A number of the congressmen, some of whom were apparently trying to advance the agenda of the newly influential Marine Hospital Service, welcomed these alarms, seeing them as potential ways to discredit the Army Medical Department and to undermine the standing of the Department's expert, Billings, and his report.⁷ In the 1884 session of Congress, then, a House Committee on Ventilation

U. S. Officers, 1876-1877," JSB Papers, NYPL, Box 69 (Ventilation and Heating).

⁶ Billings statement, in U. S. House of Representatives, Committee on Ventilation and Acoustics, *Report*, June 24, 1884, "Method of Heating, Lighting, and Ventilating the Hall of the House of Representatives" (48th Congress, 1st session, Report No. 1970), p. 71.

⁷ See Kohler, "Sanitarians and Engineers," *loc. cit.*, pp 197-207.

and Acoustics seems to have been created expressly to accomplish this. A majority of this committee first agreed to invite a Chicago firm, the Exhaust Ventilator Company, to submit an evaluation of and proposal for changes in the ventilation of the Hall of the House. Between February and June the committee held a succession of hearings to consider that plan.

Briefly summarized, the Chicago company proposed a drastic and expensive modification of the House's current ventilation system or preferably its total replacement by a different system. In so doing it directly challenged the unanimously adopted findings and changes of the 1876-77 House board of experts, specifically certain central features worked out by Billings. Chief among those had been his reliance on "a system of direct upward ventilation", which largely emulated systems of the Vienna opera house and the British houses of Parliament. The Chicago company proposed to install the opposite, or "downward system," one which not only Billings but most other knowledgeable experts were then rejecting as being ineffective.

At the hearings, the arguments of the Exhaust Ventilator Company were supported in detail by the statements of their own experts, particularly J. L. Smithmeyer, a Washington architect. Documents that he and the company submitted were then referred for evaluation or comment to a newly constituted federal advisory board composed of Joseph Henry's successor at the Smithsonian, Spencer F. Baird, as the new Chairman, along with three reappointees from the 1876-77 board, Lt. Col. Casey, Edward Clark, and Billings. Since this board had not been constituted for the purpose of conducting another full survey of the ventilation of the House, it obtained its own expert, Surgeon J. H. Kidder of the U. S. Navy. Kidder went on to make an investigation that strongly supported the findings and positions of the earlier board.

Billings, as the chief shaper of the 1876-77 study and report, was inevitably chosen to take on much of the new panel's questioning of the company's presentation. Initially he had no difficulty in refuting most of it or in criticizing the reliance of the company experts on what he considered to be the questionable authority in ventilation matters of "exhorters" or popularizers. However, that changed when the company's principal supporters on the Congressional committee abruptly abandoned all pretense of conducting the proceedings impartially and objectively. In short, they turned the proceedings into a veritable kangaroo court—aiming antagonistic questions against Billings and their other experts, irrationally belittling the latter's scientific arguments and data, and ultimately impugning the

competence of all of them. Their evident objective was to ram the company's plan through the committee by discrediting both the improvements made by the earlier ventilation board and the authority of the new experts.⁸

Faced by this overtly hostile segment of the House committee, Baird, Billings, and the other experts defended themselves as best they could and refused throughout to compromise the integrity of their views as scientists. Eventually the hearings broke up in total pandemonium and acrimony. The advisory panel left hurriedly, but not before they had voted unanimously to reject what they viewed as the company's ill-advised and poorly based proposal. Subsequently the full House sided with that rejection, making a timely expression of confidence in the panel's work and in the functioning of science.⁹

Billings, as Secretary of the Board, kept extensive minutes, both of the routine testimony at the hearings and of the vituperative outbreaks that marred them. These were not published, nor did they include his personal comments on the possible reasons behind the behavior of the congressmen. However, the historian, considering the minutes along with other contemporary fragments of evidence, is left with the strong possibility of there having been some kind or other of corruption, perhaps involving company officials, perhaps congressmen, or even some of the experts. Nevertheless, the Board as a whole seemed scrupulously clean to those who knew them. Moreover, while Gilded Age sanitary enterprises often showed themselves to be vulnerable to political corruption, I have found no evidence that Billings himself was ever implicated adversely in this or any other such affair. On the contrary, both his integrity and his competence as a public health expert were enhanced rather than tarnished in Washington circles by this particular episode.

While never regularly involved with the work of Washington's health department, Billings was well aware of health conditions in the post-Civil

⁸ U. S. House of Representatives, Committee on Ventilation and Acoustics, "Report on Methods of Heating, Lighting and Ventilating the Hall," (48th Congress, 1st Session, No. 1970, June 24, 1884), p. 71.

⁹ *Ibid.*, p. 10. See also, "Ventilating the Hall of the House of Representatives," U. S. House of Representatives, Committee on Ventilation and Acoustics, *Report*, July 2, 1884 (48th Congress, 1st Session, Report No. 2026). Includes a minority report of the committee. In addition, see JSB, "Minutes of the Board," *loc. cit.*

War District of Columbia besides those of the Capitol building. He discussed some of these in professional sanitary journals, while the local press often aired his opinions about smoky chimneys, public baths, and other public health matters. Moreover, Congress continued to seek his advice and services, sometimes on the District's problems. In 1882, testifying before a Senate committee on the sanitary condition of the city's riverfront, Billings urged the filling in of the Potomac mudflats as a measure to reduce the incidence of malarial fevers.¹⁰ At about the same time, the House of Representatives appointed him, together with architect Edward Clark and U.S. Commissioner of Education John Eaton, to look into the condition of public school buildings in the District. Their report emphasized the need for improvements in heating and ventilation.¹¹

Although the main focus of Billings's activities as a practicing sanitarian was ventilation and heating, he familiarized himself also with the work of practitioners in other areas of sanitation, especially those who were effective in promoting and running large projects in and for communities of various sizes. Outstanding among such individuals was the sanitary engineer George E. Waring, who came to his notice in the 1870s as builder of drainage and sewer systems in the northeastern areas of the United States and who proved his value to Billings with his important sewer design and construction for Memphis. While Waring, in his popular writings, had long held and disseminated a traditional non-contagionist view of disease as the rationale of sanitary work, he proved willing to learn better about such matters from Billings and ultimately to modify his rhetoric. In any case, the two were drawn together by such things as their mutual devotion to the National Board of Health, as well as by the fact that they were both men of action with common interests in applying technology to sanitary ends. Socially, Waring became one of those who was always welcome at the Billings home on Gay

¹⁰ *The Evening Star* (Washington), May 10, 1882. For additional local background, see Betty L. Hummer, "A History of Public Health in Washington, D. C., 1800-1890," Ph.D. Diss., Univ. Of Maryland, 1984.

¹¹ "Resolution," U. S. House of Representatives, Feb. 20, 1882 (47th Congress, 1st Session); JSB to Commissioners of the District of Columbia, Feb. 23, 1882, JSB Papers, NLM; JSB, "The Information Necessary to Determine the Merits of the Heating and Ventilation of a School Building," in U. S. Bureau of Education, *Circular of Information*, No. 2 (Washington: The Bureau, 1882), pp. 11-19.

Street, while for his part he kept trying to lure the frequently overworked Billings up to his home in Newport for a rest.¹²

Professionally, Waring made no secret of his high opinion of the other man: he wrote President Arthur to support Billings's candidacy for the Surgeon-Generalship, and he dedicated his 1889 book, *Sewerage and Land Drainage*, to him. In the meantime, Billings continued to be a ready and willing sponsor of Waring's occasional sanitary assignments in Washington, some of them for the federal government. In early 1880, on Billings' recommendation, the Smithsonian Institution invited Waring to lecture on the sanitary drainage of Washington. And about the same time, possibly on a similar recommendation, he was appointed special agent in charge of compiling social statistics for the tenth United States census. However, Billings was out of the country during the summer and fall of 1881, a traumatic period for the national capital, when Waring was engaged to inspect the sanitary condition of the White House to determine whether some miasmatic condition was hindering the recovery of the wounded President, James A. Garfield.¹³

In 1892 Billings was called, this time by a Senate committee, to supervise the making of still another examination of the sanitary condition of the Capitol. For this survey, Billings persuaded Waring to work with

¹² James H. Cassedy, "The Flamboyant Colonel Waring: An Anti-Contagionist Holds the American Stage in the Age of Pasteur and Koch," *Bull. Hist. Med.*, Vol. 36, No. 2 (1962), pp. 163-176. For further background on environmental sanitation and the expansion of sanitary engineering during this period, see Stanley K. Schultz and Clay McShane, "To Engineer the Metropolis: Sewers, Sanitation, and City Planning in Late-Nineteenth Century America," *Jour of Amer. Hist.*, Vol. LXV, No. 2 (Sept. 1978), pp. 384-411; and James H. Cassedy, *Charles V. Chapin and the Public Health Movement* (Cambridge, Mass.: Harvard University Press, 1962), pp. 36-125.

¹³ The President died in September, before Waring's recommended plumbing renovations had been made. This episode has been reconstructed and commented on in Nancy Tomes, *The Gospel of Germs: Men, Women, and the Microbe in American Life* (Cambridge, Mass.: Harvard University Press, 1998), pp. 68-75, 287-290. See also communication from George E. Waring to John Shaw Billings, 7 Dec. 1881, entitled, "Report on the Sanitary Condition of the Executive Mansion," in Garfield Scrapbooks, NLM. Billings does not seem to have made a public or professional statement on the Garfield death or on the Waring report.

him in investigating the building's interior ventilation, exterior drainage, and the state of the kitchens. He also obtained A. C. Abbott, a University of Pennsylvania colleague and bacteriologist, to examine the chemical composition of the air in the Senate wing, along with F. W. Farquhar, a sanitarian, to survey the plumbing and the sewage system. As anticipated, their combined reports indicated serious problems in each of these areas, with potential estimated repair costs of nearly \$100,000.¹⁴ However, as usual, Congress seems to have done little or nothing to follow through on these findings. As a result, a new panel of sanitary experts had to be engaged in 1896—Dr. Joseph J. Kinyoun of the Marine Hospital Service and engineer Henry Adams of the Treasury Department. In their report, these men took notice of Congress's continuing pattern of neglect of the sanitary recommendations made by successive postwar expert panels, and they suggested two reasons for it. For one, the tasks were indeed large and complex. But above all, at least in the House, congressmen's short terms in office made for a frequent lack of continuity of knowledgeable members. In consequence, newly constituted committees almost always had to start the inquiry process all over again.¹⁵

While Billings and his fellow federal experts were undoubtedly frustrated by the paucity of action following their sanitary recommendations, as career government officials they understood the reasons. Moreover, they had little choice but to undertake new surveys for Congress whenever called upon to do so. At the same time, those like Billings who were attempting to help elevate and professionalize civilian public health work encountered frustration there as well. In fact, almost every facet of activity in the emerging profession required both infinite patience and frequent repetition of expert advice by leaders who hoped to bring about change.

The Design and Ventilation of Urban Buildings

By the 1880s, Billings could easily produce plans for a laboratory structure, hospital, barracks, or almost any other kind of building, even

¹⁴ "The Sanitary Condition of the Capitol," Senate of the United States, Committee on Public Buildings and Grounds, *Report*, July 5, 1892 (52nd Congress, 1st session, Report No. 880).

¹⁵ See summary of their 1896 report in Senator W. S. Linton, Senate document no. 1825 (54th Congress, 1st Session), copy in JSB Papers at NYPL, Box 69.

though he had no formal credentials as an architect and never pretended to have all of the architect's skills. His approach to this type of work obviously differed fundamentally from the fine arts approach of most of the reputable architects of the day. In essence, his earlier experience of surveying army environments and needs had equipped him with a strongly empirical basis for the process of designing and erecting buildings. The impact of frontier conditions and tight budgets in themselves combined eventually by 1870 to help produce in him a philosophy of architectural simplicity, utility, and functionalism, while the shifting current ideas about disease transmission contributed to his embracing a somewhat Jeffersonesque concept of limiting some military buildings, especially hospitals, to life spans of around fifteen years.

For Billings, this philosophy was strongly reinforced by the injunctions that were delivered by Thomas Huxley in 1876 at the opening of Johns Hopkins University. Particularly resonant was the latter's advice to the university launchers not to rely on the conventional formulae of trained architects for the new academic buildings; rather, they should turn to "honest bricklayers" if truly serviceable laboratories or other structures were desired.¹⁶ In his subsequent career as designer and builder, accordingly, so far as he had the choice, Billings firmly rejected the employment of the monumental or other fashionable architectural styles in either his exterior facades or his interiors. In so doing, he became one of the leading Gilded Age exponents of the utilitarian and functional in American building. And as such he came to be thought of by many as being an architect, though he himself continued to point out that there were distinct professional differences between his work and that of most architectural taste-setters.

Implementation of Billings's plans for a scientifically up-to-date medical museum and library in Washington in the mid-1880s was certainly facilitated by the fact that he himself was principal designer of the building. He certainly had well-developed ideas of what he did not want, originating

¹⁶ John Burchard and Albert Bush-Brown, *The Architecture of America: A Social and Cultural History* (Boston: Little, Brown, 1961), pp. 102-104, 178-184. Presenting Billings as their leading exemplar of utilitarianism and functionalism in scientific and medical buildings during that period, the authors tie his ideas by inference not only to the influence of Huxley's oration but to a gathering critique and rejection by some Americans of the formalism exhibited by much of the established fraternity of architects.

from his having had to work in the makeshift facilities that Fords Theatre had afforded. However, he also learned much from his readings about and visits to libraries in Europe and the United States as well as from his experience as consultant for new medical libraries in Boston, New York, and other locations. Ideas for the museum portion, in turn, seem to have been drawn from similar sources, including Washington's National Museum as well as from plans borrowed from other institutions and studied in his own offices.

Billings's wishes for the new building, as refined and drawn up by the architect, Adolph Cluss, were subject to severe modifications before the structure was completed. Because of a barebones appropriation from Congress, there was little money for innovation or experimentation in the design, let alone for decoration. As a result, the interior when finished strongly reflected the utilitarian furnishings of its different sections: the long iron bookstacks in the library; the rows of showcases in the museum; the purposeful apparatus of laboratories and work rooms; and the plain shelves and desks of numerous clerks. At the same time, the spaces allowed for toilets and washrooms were cramped, while provisions for other basic amenities and comforts were similarly cut back.¹⁷ Meanwhile, the exterior of the building was completed just as Billings had wanted it to be, "exceedingly plain, without ornamentation."¹⁸ His general idea seemed to be, and it was reinforced in some of his other buildings, that individuals who were truly committed to the pursuit of the medical and scientific revolution should be willing both to settle for a minimum of architectural splendor in any military medical structure and to put up with a certain lack of amenities and comforts.

Nevertheless, in the next few years, the building's features attracted serious interest from various segments of the library and museum communities. For instance, W. H. Bradley, a trustee of Chicago's Newberry Library, went to see the new building in Washington and to consult Billings on "library construction, arrangement and management," while Columbia Teachers College invited the latter to present his concepts of library and hospital construction in lectures to the students and faculty. Officers of the New York Academy of Medicine, considering the purchase of new book stacks for its library, decided to adopt the type that Billings had designed for the

¹⁷ Miles, *National Library of Medicine*, pp. 165-167.

¹⁸ Henry, *Armed Forces Institute*, p. 82.

Army. And F. W. Peabody, curator of Harvard's Peabody Museum, wrote for technical information, in his case for details about certain features that might well be adopted in a new wing of the Cambridge museum. He wanted a "sketch showing the arrangement of the floors," information about the iron girders as well as about the hollow bricks used in the arches, and, where were the bricks made? Not least, he was "so much pleased with the floors that you are to have that I wish to have them in our building."¹⁹

Demand for Billings's skills as designer and planner also spread, during the 1880s and '90s, beyond the library, museum, and hospital communities to groups requiring planning advice for other types of structures ranging from office buildings to city halls. But it was the nation's public schools that generated the most urgent and most numerous inquiries. School board members and health officers in particular wrote Billings for advice or plans for school construction, ventilation, and heating. Most were concerned with these and other sanitary problems of two-story urban schools. However, Henry B. Holton of the Vermont State Board of Health needed suggestions for the state's one-room rural schools. Later he asked Billings to review the board's proposed regulations for the construction and ventilation of schools and to suggest amendments.²⁰

In the early 1880s Billings served as examiner for the National Academy of Design's competition to select the best plans for schoolhouses, as well as on the House's committee on school buildings.²¹ Billings also discussed these subjects before such groups as the National Educational Association, but he declined G. Stanley Hall's invitation to speak at Clark University on "The Ideal Public School Building & Grounds." His reason for declining was that the University would not reimburse his expenses and by that omission failed to recognize his professional status. Quite simply, he reasoned that his

¹⁹ D. B. Delavan to JSB, 9/27/1889, in JSB papers NYPL; Isabel Hampton Robb to JSB, 12/11/1899; Egbert H. Grandin to JSB, 2/15/1894; F. W. Peabody to JSB, 2/18/1888; the last three in JSB papers NLM.

²⁰ Henry B. Holton to JSB, 2/21/1897 and 3/22/1897, in JSB papers NYPL.

²¹ U. S. House of Representatives, "Resolution" of the House, Feb. 20, 1882 (47th Congress, 1st session); JSB to Commissioners of the District of Columbia, 2/23/1882, JSB papers NLM; JSB, "The Information Necessary to Determine the Merits of the Heating and Ventilation of a School Building," in U. S. Bureau of Education, *Circular of Information*, No. 2 (Washington: The Bureau, 1882), pp. 11-19.

expertise "in the planning and arrangement of a school or hospital should be counted in and provided for in the estimates of its cost quite as much as . . . are the bricks or the work of the architect."²²

The undoubted apex of Billings's professional career as a planner and arranger of public health and medical structures occurred in May 1889 with the long-awaited completion of the Johns Hopkins Hospital complex and the event of its ceremonial opening. Of probable equal interest to him, however, was the announcement in Philadelphia, only four months later, of the University of Pennsylvania's decision to build a research institute or laboratory of hygiene with himself named as planner and supervisor of construction as well as director and professor.

The designing of the Penn institute was obviously a congenial undertaking for Billings; he was well aware of its pace-setting significance even if not actually "the first structure of its kind erected in the United States." As such, he planned it consciously as a model, providing, among other features, an original and sophisticated air circulation system and equipping the rooms with up-to-date research facilities and apparatus. Much as in his Hopkins design, he provided for installation of a variety of different sizes and styles of radiators, vents, blowers, and other heating and ventilation apparatus in the different rooms with the intention that the building interior itself would be part of an ongoing experimental design.

During the planning and construction phases, he came to enjoy a close and productive relationship with the university's architects, Collins and Autenrieth. As a key element of this, they worked out together a plain and mutually satisfying functional solution for the building. Billings noted that solution in his address at the opening exercises of the institution in February 1892. "As regards the external appearance of the building," he noted, "opinions will, of course, differ. I will only say that it has been planned from within outward, which is the reason why it looks like a laboratory and not like a castle or a cathedral."²³

²² G. Stanley Hall to JSB, 6/20/1891; and JSB to Hall, undated draft of 1891; both in JSB papers NYPL. For his designs of governmental buildings, Billings did not receive fees.

²³ JSB, "Address of John S. Billings, M.D.," *The Opening Exercises of the Institute of Hygiene of the University of Pennsylvania, Philadelphia, February 22, 1892*, (Philadelphia: The University, 1892), passim but especially pp. 17 and 27. For additional rich details, historical and architectural, see Susan Glassman

Two years later, the University officials asked Billings to draw up plans for yet another laboratory structure, this one to be attached to the University Hospital. Working this time with the architectural firm of Cope and Stewardson, he planned and completed the William Pepper Laboratory of Clinical Medicine within two years. Considered to be the earliest American institution specifically devoted to clinical research, the four-story laboratory was dedicated in December 1895. However, Billings did not take over its immediate direction and seems never to have taken as much interest in its purposes and internal features as in those of the Hygiene Laboratory.²⁴

As his various buildings rose across urban America, Billings also began playing an adjunct role as explicator, and to some extent popularizer, of the technological principles and practices involved in this emerging specialty of building design and planning. To be sure, he was covering much of this material in his hygiene courses at Hopkins, Columbia, and Pennsylvania. But it had become evident that there was a broader demand for such information or learning than those courses could supply.

The post-Civil War period brought an increase in the number of American journals in the general fields of engineering, architecture, and technology as well as of such health or science-related periodicals as *The Sanitarian*, *The Popular Science Monthly*, and *The Hospital*. Billings's writings and projects in these fields were published in several of these, but in none as systematically as in *The Plumber* and its successor, *The Sanitary Engineer*.

In 1879, taking advantage of Billings's consultancy at the Johns Hopkins Hospital, the editor of *The Plumber* invited him to prepare a series of papers about that experience. These were intended principally to deal in some detail with the kinds of interior technical problems that Billings was encountering as the hospital progressed. Using the general title of "Letters to a Young Architect on Ventilation and Heating," he ran the series regularly in *The Plumber* until 1880, at which point *The Sanitary Engineer* took over the feature, continuing it to early 1883. The "letters" were originally prepared as replies to random questions sent the editor from sanitary engineers,

and Julie Johnson, "Institute of Hygiene, University of Pennsylvania," in U. S. National Park Service, *National Register of Historic Places: Registration Form*, (Philadelphia: Wagner Free Institute of Science, 1993), various paginations. See also Garrison, *Billings*, pp. 278-282; and Chapman, *Order Out of Chaos*, pp. 265-271.

²⁴ *Ibid.*, pp. 271-272; and *Public Ledger*, Philadelphia, 12/5/1895.

physicians, relatively new architects, and others. They were intended to “provide practical directions . . . which can be easily understood by an intelligent builder” rather than forming a systematic and technically advanced manual for skilled architects or engineers.²⁵

After completing his series, and upon the suggestion of Henry C. Meyer, editor of *The Sanitary Engineer*, Billings rearranged and partially rewrote the papers, added some new illustrations and other material, and published them in book form in 1884 as *The Principles of Ventilation and Heating and their Practical Application*. For its material, the book now drew substantially from Billings’s other early building designs and projects, not only those for the Hopkins hospital but for the Barnes Hospital and the hall of the House of Representatives. However, another large part was devoted to his analyses and descriptions of the interior features of other structures that he had inspected and of the plans of still others that were supplied to him by builders or architects. While including features that had impressed him about a few European buildings he had personally studied, including some in Vienna, London, and St. Petersburg, for the most part the book was a review and technological critique of the liveability of selected large public buildings of gilded age America. A sizeable number were New York City landmarks, among them the Metropolitan Opera House, Madison Square Theatre, the Union League Club, and the Fifth Avenue Presbyterian Church, together with some residences of the well-to-do. But there were also a few scattered illustrations of buildings located elsewhere, including a high school in Bridgeport, Connecticut, the Cook County Hospital in Chicago, and the Academy of Music in Baltimore.²⁶

In response to continuing demand, the publisher reprinted the work within a few years. Meanwhile, Billings began preparing a virtually new and greatly expanded volume on the same subject, as usual doing most of his research and writing in his Washington office. In this latter opus, *Ventilation and Heating*, which appeared in 1893, he discussed the technical features of many more buildings than he had covered in the earlier volume, including several of his own later buildings. He also introduced illustrations from

²⁵ JSB, *The Principles of Ventilation and Heating and their Practical Application* (New York: The Sanitary Engineer, 1884), preface, and pp. 13-14. Billings also wrote occasional articles for this journal on other technical aspects of sanitation and public health, including a shorter series on vital statistics.

²⁶ *Ibid.*, passim.

substantially more American communities outside of New York City and the East than he had used earlier, and he added a history and bibliography of ventilation. Most striking, however, was his consideration of the ventilation of an important cross-section of America's industrial, commercial, and service structures, including mines, ships, tunnels, railway cars, prisons, sewers, stables, and shops.²⁷

As much as his analyses of urban mortality statistics, Billings's large tomes on ventilation and heating were impressive attempts to improve basic health and living conditions in the Gilded Age. On the technical side alone, they led to the marked elevation of his stature in a number of related building and engineering professions. They also eventually brought him, not that he needed or sought it, at least partial admission into the fraternity of architects. In 1892, the Washington Chapter of the American Institute of Architects elected him their first honorary member, while two years later the national body followed suit. And in 1894 the American Society of Heating and Ventilating Engineers honored him as one of its charter members.

As he prepared his 1893 tome, Billings reflected on the changes in ventilation and heating provisions that had occurred since 1870. He particularly noted the modifications that he had made in his own ventilation planning practices in response to the changing knowledge about the nature and behavior of germs. Along with other up-to-date sanitarians, he had found less and less evidence over the years that germs, fungi, or other causes of infectious diseases were spread promiscuously around buildings on drafts or vague miasmas that needed to be warded off by ventilation systems. Instead, he acted increasingly on the assumption that the greatest benefits from ventilation and heating controls lay in their capacity to promote people's general physical well-being and comfort. Public health circles of the early 1890s, however, remained of two minds about this, with many apparently still believing that the central purpose of ventilation "was to prevent people from being poisoned by their own exhalations," i.e. by carbon dioxide.²⁸

Billings had his own guess about this matter but agreed that it was not yet supported by a preponderance of reliable scientific evidence. Soon

²⁷ JSB, *Ventilation and Heating* (New York: The Engineering Record, 1893), *passim*.

²⁸ George T. Palmer, "What Fifty Years Have Done for Ventilation," Mazyck P. Ravenel, ed., *A Half Century of Public Health* (New York: American Public Health Association, 1921), (Reprint Edition 1970 by Arno Press), p. 338.

after the opening of his Laboratory of Hygiene in Philadelphia he took up the matter with S. Weir Mitchell, and the two men decided to organize a laboratory research project of their own to look for fuller answers. In May, 1893, the Smithsonian Institution awarded them a grant for the specific purpose of investigating "the nature of the peculiar substances of organic origin contained in the air expired by human beings, with special reference to the practical application of the results obtained to problems of ventilation for inhabited rooms." Under the grant, the actual experiments, including replications of the work of earlier investigators, were carried out at the laboratory over the next two years or so by a young physician, David H. Bergey, with technical support from A. C. Abbott and others. Billings and Mitchell reviewed the experiments closely at every stage, suggesting "modifications or new experiments as the work progressed."²⁹

For the final report that came out late in 1895, the technical appendices were prepared by Bergey and the narrative sections seemingly by Billings. The conclusions must have been highly satisfying for the latter to spell out, providing, as they did, highly explicit confirmation of his early hunches and understanding of the relationship of ventilation to health. The results of the experiments were such, they asserted, as to "make it very improbable that the minute quantity of organic matter contained in the air expired from human lungs has any deleterious influence upon men who inhale it in ordinary rooms, and, hence, it is probably unnecessary to take this factor into account in providing for the ventilation of such rooms." Moreover, they concluded, "The discomfort produced by crowded, ill-ventilated rooms in persons not accustomed to them is not due to the excess of carbonic acid, nor to bacteria, nor, in most cases, to dusts of any kind. The two great causes of such discomfort, though not the only ones, are excessive temperatures and unpleasant odors."³⁰

Looking back in 1921 to some of the early days of his profession, George T. Palmer, a later ventilation expert, concluded that in the decades since 1870, the period of Billings's heaviest involvement in the specialty, "the

²⁹ J. S. Billings, S. Weir Mitchell, and D. H. Bergey, *The Composition of Expired Air and its Effects upon Animal Life* (Washington: Smithsonian Institution, 1895), pp. iii and 341. The Smithsonian grant was vetted for merit by an outside expert committee composed of Horatio C. Wood, William H. Welch, and Charles S. Minot.

³⁰ *Ibid.*, pp. 24 and 26.

most outstanding change in ventilation . . . has been the substitution of experimentation for guesswork." Moreover, he thought that the findings of Billings, Mitchell, and Bergey had been particularly noteworthy among the researches of that period. Their 1895 contribution, he believed, had been a bold, definitive, and "astonishingly clear" statement in its flat assertion "that chemical impurities were insignificant as causes of discomfort in occupied rooms, and that bad ventilation was in reality due to excessive temperature and moisture." Palmer saw those researches and conclusions as marking "the dawn of a new conception of ventilation," and he marvelled at their lasting power, at their having been "so closely in agreement with our understanding of the situation today after twenty-five years of further experimentation."³¹

Drawing up Agendas for Sanitation and Public Health:

Even as Billings immersed himself in the practical sanitary challenges of buildings large and small, he also productively involved himself in the intellectual processes of helping define priorities, tasks, and limits for post Civil War America's emergent public health profession. Early agenda-shaping was obviously necessitated and stimulated, particularly during the 1870s, by his concurrent involvements and responsibilities in the American Public Health Association and the A.M.A.'s Section on State Medicine and Public Health. And later on, in the give and take of those organizations as well as of working sanitary departments or health agencies, he found abundant occasion to defend and test the merits of his various agenda components.

As early as 1875, Billings published an initial outline of tasks and challenges that among other things suggested ways of redefining and modernizing the profession of sanitation and public health. From that presentation, he went on to issue a series of analyses, critiques and exhortations intended to provide various audiences with details of how to organize and improve the health of Gilded Age America in ways that were both professional and scientific. Tailoring his messages as appropriate respectively for physicians, scientists, sanitarians, and other kinds of public health practitioners, Billings presented his own gradually changing views to the appropriate professional organizations, in national publications, and in academia. Though Henry I. Bowditch, Ezra Hunt, Stephen Smith, and

³¹ Palmer, *loc. cit.*, pp. 335-344. The quotations are from pp. 335 and 341.

others also offered schemas of the scope and future of public hygiene, none argued as persistently, comprehensively, or rationally as Billings. As a result, through these multiple presentations, by the 1880s his personal views rapidly became substantially accepted as the unofficial though authoritative agenda, both for the profession as a whole and for its segments.

Addressing the APHA in Boston in 1876, Billings stressed the fact that modern public health work required a much larger degree of expertise than many old line sanitarians had realized or been accustomed to. And to illustrate this, he re-emphasized such current shortcomings as the typical health officer's lack of precise knowledge about the causes of disease; the absence of statistics suitable for testing the value of their public health measures; and the lack of facilities for training public health officials.³² Four years later, in his Presidential address to the Association in New Orleans, Billings noted other kinds of obstacles, among them the absence of adequate salaries and full-time employment for public health professionals, as well as the continuing lack of uniformity in disease terminology. But, on that occasion, he particularly stressed the urgent need for the Association's members to turn substantially to laboratory research in the various sanitary sciences, a step that many of their European counterparts had already taken. "It is probable," he observed, "that if we knew the whole life history of half a dozen minute organisms . . . we should know the causes of some of our most destructive diseases and could proceed with their prevention upon truly scientific principles."³³

In his 1879 report as Chairman of the A.M.A.'s Section on State Medicine and Public Health, Billings found but little recent "progress" in the section's areas of concern. To be sure, he noted, "the number of new patent ventilators, sewer gas traps, sanitary soaps, etc., has been above the average, [but] it must be admitted that in our knowledge of the causes of disease, or of the means of avoiding or destroying those causes, little or no positive advance has been made during the year." At the same time, the medical literature of the previous year included as usual a considerable array of claims of discoveries in these latter areas—and Billings cited a few, including the presumed discovery of the bacillus of diphtheria by Ewart and Simpson. But all of those that he found in the literature were premature and still in

³² JSB, "Rights, Duties and Privileges," *loc. cit.*, 48-52.

³³ JSB, "The President's Address," *Public Health: Papers and Reports*, Vol. 6 (1880), pp. 1-11. The quotation is on p. 2.

need of satisfactory proof and confirmation. Accordingly, he concluded, "as yet we must suspend judgment as to the correctness of the conclusions." Citing similar tentative conclusions in much of the other scientific literature, Billings then devoted the remainder of his address mainly to a recapitulation of other public health needs.³⁴

At this same time Billings was working on what became his fullest elaboration of a public health agenda. In 1878, the New York otologist Albert H. Buck invited him to prepare a substantial introduction to a new text on the practice of hygiene and public health in the United States. He also solicited Billings's opinion on the tentative outline of the work and sought suggestions for additional chapters and authors.

Billings divided his own contribution into three sections. The first included a detailed review of the scope, values, and dominant rationale of nineteenth century public health down to the mid-1870s. France, Germany, and England all continued to offer instructive models for the field's development in the United States, but he warned against attempting to adopt any of them in toto in this country. "The results will probably disappoint us." The main reasons, he thought, were that most parts of the United States still lacked the basic sanitary legislation, administrative bodies, and mechanisms, did not have the necessary experts to run them, and in other respects were not yet ready to profit from organized public health. Moreover, he maintained, even those communities that had been installing the various sanitary measures could not claim that their public health programs were either scientific or truly socially useful until they established disease registers and other tools for evaluating the measures. "The absence of the information which such registers would give is one of the greatest obstacles to hygienic progress, for it is due to this that our legislators and political economists do not take the hygiene of the people into consideration, except in a few special cases."³⁵

In his second section, Billings summarized and assessed the concepts of the 1870s pertaining to the causes of disease. Discussing the lingering filth theory of disease, principally through the recent critique by the British sanitarian John Simon, he was skeptical of it being able to furnish helpful

³⁴ JSB, "Address in State Medicine and Public Hygiene," *Transactions of the A.M.A.*, XXX (1879), pp. 279-291. Quotations are on p.279.

³⁵ JSB, "Introduction," in Albert H. Buck, ed., *A Treatise on Hygiene and Public Health*, 2 vols. (New York: William Wood, 1879), I, p. 10.

answers to the scientific questions of the day. At least, he cautioned, "it is necessary not to overestimate it, and to beware of the popular notion that filth is almost the only thing which requires the attention of the sanitarian."

Accordingly, Billings once more pointed his readers in more constructive directions: "Our hope of substantial progress in knowledge of the causes of disease rest mainly on two methods as yet little used, namely, on the registration of disease and on comparative experimental pathology." He illustrated the former by reference to William Farr's statistical analyses in England of the nature and behavior of epidemics, but saw little likelihood of there being much research at that level from American data in the near future. In contrast, he reported that some limited American laboratory investigation, particularly in microbiology, had begun, though he stressed that it needed much stimulation before it could be expected to play any considerable part in the improvement of public health in this country. Billings went on to review at some length the latest classifications and definitions of microscopic organisms or "germs" and to summarize current etiological knowledge about numerous diseases. He emphasized the value of Pasteur's contributions to "scientific precision" in his fermentation research as well as Koch's innovative laboratory methods for isolating and cultivating bacteria. And he urged that some of the new methods be applied to other diseases, such as the economically damaging and frustrating Texas Cattle Fever, a disease which he himself and Edward Curtis had fruitlessly investigated a decade earlier.³⁶

The final section of Billings's contribution to the Buck text dealt with an equally important topic for sanitarians, the "Jurisprudence of Hygiene."

³⁶ Quotations in this paragraph are, in succession, from *Ibid.*, pp. 29, 34, 23, 15, 19, 20. For Billings's research on Texas cattle fever, see chapter 3 of this book.

Billings continued to refine his definitions of the terms sanitation, hygiene, and public health, depending on his audiences. In 1895 he offered a comprehensive definition of 'sanitary science.' "By sanitary science, we mean, not a definite branch of accurate investigation by means of peculiar instruments and methods, such as astronomy or chemistry, but the sum of all the means of accurate investigation used in, and the conclusions of all branches of science which give increase of knowledge with regard to the nature and importance of the causes of disease and death in man and the means of avoiding, doing away with, or preventing the action of these causes." JSB, "The World's Debt to Modern Sanitary Science," *The Chautauquan*, Vol. 21, no. 1 (April 1895), p. 18.

In it he reviewed and commented on the legal bases of sanitation in Europe and America, on types of legislation, and on desirable provisions to include in such laws. And, as a guide to lawmakers and sanitarians alike, he provided bibliographical lists of authoritative works dealing with public health legislation, of general treatises and official reports on public health, and of journals and transactions of professional societies.

Published in 1879, Buck's two volume *Treatise on Hygiene and Public Health* before long at least partially succeeded the British work of E. A. Parkes as the standard text in its field in late nineteenth century America. It included twenty-five chapters by American specialists in the various branches of state medicine and sanitation. Several of the authors in addition to Billings enjoyed national reputations; among them, the New York pediatrician Abraham Jacobi, the President of the Philadelphia Board of Health, William H. Ford, and the sanitary engineer William R. Nichols of the Massachusetts Institute of Technology. For the historian, the work now appears as a definitive profile of the field at a brief but interesting transition period of American medical and sanitary thought. However, despite its momentary authority, within hardly a decade, if that, much of its material was made obsolete by new certainties and knowledge of the bacteriological age. Of its chapters, only Billings's introduction had really embraced and given directions to the public health community for reaching out to that new scientific world.

Hygiene and Public Health in Academia:

Central to Billings's expositions of his agenda was his conviction of the need to enlist more members of the medical profession in the new, for the United States, fields of state medicine and public health. But equally necessary for the future of the field was the expeditious establishment of special academic facilities and programs for the training of its professionals, facilities which were almost totally lacking at the time. By the mid-1870s Billings had begun cultivating interest along this line among friends both in medical schools and in other departments of America's colleges and universities. And over the next two decades he succeeded to the point of not only gaining the support of several institutional heads for such programs but in obtaining appointments to launch them himself and to do some of the instruction, though necessarily as part-time arrangements.

A natural place for Billings to attempt a start was the Johns Hopkins University. As part of his prospectus of 1877 for the intended Hopkins medical school, he had indeed included a remarkably comprehensive

program of studies in state medicine and related topics.³⁷ State medicine, Billings granted, was as yet “not a familiar [term] in this country, owing to the almost total absence of the thing itself.” But he went on to define it in all its breadth, as one of the dynamic central features, along with the university systems and the cultures of science, for instance, that made mid-nineteenth European medicine so worth emulating in the United States.

To propose that the embryo university consider developing a curriculum in state medicine was a large order, using it as he did as an umbrella term which included such subjects or concepts as preventive medicine, the registration of vital statistics, sanitation, hygiene, public health administration, and forensic medicine. In other words, he issued a challenge to Hopkins to do thoroughly what no other American educational institution had yet attempted to do at all, to train experts to cope with the crucial health problems and tasks of the Gilded Age. Among the most pressing of these latter, he cited “the steadily increasing pollution of our Water supplies, the Hygiene of Schools, the construction and management of Municipal Hospitals, the regulation of Prostitution, the prevention of the sale of improper or adulterated articles of food, [and the amelioration] of dangerous and unhealthful trades and occupations.”³⁸

In sum, thinking of Pettenkofer’s noted Institute of Hygiene in Munich and other European institutions, Billings proposed that the anticipated Hopkins medical school, in addition to its other innovations, should design for the United States a rather similar and truly revolutionary curriculum for hygiene and state medicine. Its students should have thorough training in microscopy and analytical chemistry, with special attention to bacteria and other lower forms of life. They should gain practical skills in analyzing air, water, food, and drink. Courses should be included on the principles of engineering and building construction, particularly in relation to the health aspects of ventilation, plumbing, drainage, sewerage, and other sanitary mechanisms. Before graduating, the student “should be able to make a topographical sketch of a given district, and should have a sufficient knowledge of Geology to understand the position of Strata and their

³⁷ JSB, *Medical Education*, pp. 347-348, 352. For other American initiatives of this period, see Judith Leavitt, “Public Health and Preventive Medicine,” in Ronald L. Numbers, ed., *The Education of American Physicians* (Berkeley: University of California Press, 1980), pp. 250-256.

³⁸ JSB, *Medical Education*, pp. 347-353.

influence on Sanitation.” And, far from least important, he should become proficient in mathematics, vital statistics, and epidemiological methods, as well as familiar with the processes of legislation and the sanitary laws of various countries, states, and local communities.³⁹

Billings’s comprehensive plan for public health at Hopkins was obviously very dear to his heart, but few other Americans were yet ready for it. It was far ahead even of the innovative Johns Hopkins University’s capacity to implement during his lifetime. His hygiene lectures at the medical school did enable him for some time to pass on portions of his dreams for public health to faculty and students alike. But he essentially phased them out after 1893, while the University put off creation of a comprehensive School of Hygiene and Public Health until 1918.⁴⁰

During the same post Civil War period, Billings took some rather similar steps to initiate public health instruction at Columbia College (later University) in New York. One of his associates in the American Public Health Association was the President of the college, Frederick A. P. Barnard. In 1873, recently returned from visits to universities and scientific laboratories abroad, Barnard delivered a paper to the Association that reported on current European developments relating to the germ theory of disease and its relations to hygiene. During the following decade he seems to have periodically considered the possible creation at Columbia of a laboratory of hygiene to be modelled on the Pettenkofer Institute in Munich. In 1883 he persuaded Billings to lay some of the groundwork for such an institution, to be based in the college’s School of Mines.⁴¹ As a starter, Billings instituted a course of lectures on hygiene, a series that included large amounts of instruction on drainage, ventilation, water and sewerage systems, and other aspects of sanitary engineering. In addition, he helped the Department of Biology and Microscopy to organize its laboratory, specifically by drawing up lists of essential research instruments as well as of such desirable teaching devices as “a model of a house to illustrate various modes of ventilation.”

At another level, Billings urged the Columbia administration, not only to appoint a full-time professor of biology, but to take steps to elevate the status of sanitary engineering as a field of university studies. “It should . . . be definitely understood that a sanitary engineer should be much more than

³⁹ *Ibid.*, p. 353.

⁴⁰ Chapman, *Order Out of Chaos*, pp. 136-144.

⁴¹ JSB to Barnard, 12/4/83 and 5/28/86, JSB Papers at NLM.

an inspector of house plumbing or of nuisances." Such persons should thus be given the complex skills necessary, for instance, to design public water and sewage works as well as ventilating and heating systems.⁴²

Due to his other commitments, Billings never pushed for a comprehensive hygiene institute at Columbia. However, he profited professionally from his connections with several of the other faculty members, particularly with the Professor of Engineering, William P. Trowbridge, whose own researches on heating and ventilation helped undergird the former's writings on those topics. Moreover, even after Barnard's death, Billings continued his association with the School of Mines into the early 1890s. Every year, he set aside the necessary time to travel to New York to present either one or two series of ten lectures as requested. And while there he remained a productive participant in the meetings of the school's student-faculty engineering society.⁴³

Despite his academic allegiances and satisfactions at Johns Hopkins and Columbia, Billings apparently made no real attempt, late in this period, to refuse requests from the leaders of two other institutions to participate in their pioneering academic programs. One of these was George Sternberg, who, in one of his first acts as Surgeon General, initiated and organized the long-hoped-for Army Medical School. The school opened in Washington in November 1893, in the same building as the Army's medical museum and medical library. Along with courses on surgery, law, and military procedures, it offered several courses of public health relevance. Billings was named professor of military hygiene, covering such topics as the sanitary aspects of air, water, food, and clothing, while his recently arrived associate at the museum, Walter Reed, became professor of clinical and sanitary microscopy as well as director of the pathological laboratory. In addition, special lectures were given by Sternberg on bacteriology and by Charles Wardell Stiles, then at the Department of Agriculture, on parasites of man.

The end of the school's first session was celebrated properly with appropriate speeches and ceremonies for the five graduates. The organizers bowed to history by including former Surgeon General William A. Hammond, one of the original proponents of the school as well as the

⁴² JSB to C. R. Agnew, 12/11/84, JSB Papers, NLM.

⁴³ Charles D. Searle to JSB, 1/10/93, JSB Papers, NLM. For some of Billings's debts to Trowbridge, see JSB, *Ventilation and Heating* (New York: The Engineering Record, 1893), pp. 144, 148-154.

“father” of modern American military hygiene, among the distinguished guests. Billings himself continued on the school’s faculty only one more year. Shortly after the 1894-95 session ended he resigned from the school as well as from the Army.⁴⁴

Billings’s army resignations were among his final steps in fulfilling the several-sided commitment that he had entered into several years earlier with the University of Pennsylvania. The central feature of that commitment was his designation as Professor of Hygiene and Director of the new Institute or Laboratory of Hygiene.⁴⁵ Of course, Mitchell, Pepper, and his other sponsors at Penn had been long aware of Billings’s scientific contributions and reputation in hygiene, sanitation and public health. As early as 1881, Pepper invited the other man to prepare a chapter on hygiene for a text he was preparing, *A System of Practical Medicine*. As he acknowledged, “You are identified with [those topics] as we have developed them in America.”⁴⁶ Later in that decade, Billings may also have privately expressed to one or more of his Philadelphia friends some degree of impatience with the slow and limited implementation at Johns Hopkins and Columbia of his full scheme of instruction in these subjects, that is with the failure of either institution to commit itself to an institute of hygiene that might combine the approaches of Pettenkofer’s and Koch’s institutes. After reaching his 1889 agreement with Pepper for such an institute, Billings immediately began planning and supervising its construction. He also began giving periodic lectures on hygiene, while the following summer he travelled to Europe to examine existing European hygiene institutes.

⁴⁴ For comments on the founding of the army medical school, see Robert S. Henry, *The Armed Forces Institute of Pathology: Its First Century 1862-1962* (Washington: Office of the Surgeon-General of the Army, 1964), pp. 90-95; Gillett, *Army Medical Department, 1865-1917*, pp. 97-99.

⁴⁵ See discussion in chapter 4.

⁴⁶ William Pepper to JSB, undated but probably late 1881, JSB Papers, NYPL. Billings accepted the invitation. His chapter, on “Hygiene,” appeared in Volume I of Pepper’s *A System of Practical Medicine* (Philadelphia: Lea Brothers, 1885). Intended to educate general practitioners and medical students, the chapter was another part of his continuing effort to explain and advance the modern fields of hygiene and public health. Another of Pepper’s works, his 1893 *Textbook of the Theory and Practice of Medicine*, included a comparable chapter by Billings.

Pennsylvania's Institute of Hygiene opened with appropriate fanfare in February 1892 as the first teaching institution of its kind in the United States. Billings envisioned it as eventually providing research services to virtually all areas of the discipline, either in its own building or elsewhere and potentially in collaboration with other academic departments. He also looked forward to working to some extent with state and local health departments and actually did some consulting with both during his short tenure.⁴⁷ However, at this stage, his attention was largely divided between fitting out the laboratories and completing the other physical facilities of the building along with conducting the Institute's modest initial academic program. This latter consisted mainly of two basic courses. Billings himself taught the course in practical hygiene, which included lectures as well as laboratory work on topics very similar in scope to his lectures elsewhere. Alexander C. Abbott, who was brought on from Johns Hopkins University to be Billings's principal assistant in the Institute, taught an elementary course in bacteriology.⁴⁸

From the available evidence, it is clear that the Institute of Hygiene did not achieve great success during these years, and scholars have concluded that Billings himself must have been responsible in some way or another for the steady decline in student enrollments after their 1892 high of eleven. However, few conclusive reasons have been offered as to why it occurred or even whether these graduate enrollments were actually small in numbers when considered by the expectations of Billings and his contemporaries. In his search for answers, George Corner speculated that Billings tried to cover too much ground in his course and that he had a prosaic teaching style that turned students off. He felt that Billings was also delinquent in such things as developing networks of support for the Institute within the University, in advertising it, and in actively seeking out and developing students, or

⁴⁷ Jonathan M. Liebenau, "Public Health and the Production and Use of Diphtheria Antitoxin in Philadelphia," *Bull. Hist. Med.*, Vol. 61 (1987), pp. 219-220. This article notes but provides no specific details on Billings's activities.

⁴⁸ Addresses by Billings and other speakers on this occasion, together with outlines of the initial courses, are included in *The Opening Exercises of the Institute of Hygiene of the University of Pennsylvania* (Philadelphia: The University, 1892).

in short, that he failed to exercise effective management of the unit on any continuing basis.⁴⁹

Whatever truth there may be in these suggestions, it appears to me that any such delinquencies can have been only partial reasons for the decline. Another reason may have been the possibility that Billings never had the amount of time needed, either to teach or to administer the Institute properly. Through most of his 1889-1895 affiliation with the University of Pennsylvania, he was on a part-time arrangement which usually brought him to the campus only one day per week. However, in 1895, when he became full-time, he stated that he had had ample time to accomplish everything he had agreed to do at the Institute.

This and other clues suggest that by 1895, when he resigned from the university, Billings may simply have become bored with his situation at the University of Pennsylvania. At least, he seems to have concluded that the package of responsibilities arranged for him at the University were no longer adequate. Specifically, he may well have concluded that there was no way they could continue to provide him with public health and medical challenges of the same magnitude as those that he had been grappling with during the previous thirty years, in or made possible by the federal government. Certainly this would have been true of the enormous tasks that he had faced during his rocky assignment with America's first federal health body, the National Board of Health.

⁴⁹ George W. Corner, *Two Centuries of Medicine: A History of the School of Medicine, University of Pennsylvania* (Philadelphia: Lippincott, 1965), pp. 180-183. Arthur J. Viseltear, in his review of early public health education initiatives, reviewed the formation of the Pennsylvania Institute and Billings's roles in it, but he did not acknowledge Billings's other teaching stints. Arthur J. Viseltear, "The Emergence of Pioneering Public Health Education Programs in the United States," *Yale J. of Biol. and Med.*, vol. 61 (1988), pp. 539-542. Viseltear's article is reprinted in Elizabeth Fee and Roy M. Acheson, ed., *A History of Education in Public Health: Health that Mocks the Doctors' Rules* (Oxford: Oxford University Press, 1991), pp. 114-154.

Chapter 6

The National Board of Health: A Painful Experiment

With Billings's work and that of his Army colleagues, the Surgeon General's Office by the 1870s increasingly took on the character of a large health department. Its officers were called upon to carry out epidemiological studies and prepare other scientific reports. Its museum had facilities for chemical analyses and other laboratory investigations. Staff experts were made available to serve as health consultants to other government and private agencies. Field surgeons acting as registrars carried out regular duties for the army's nationwide vital statistics system. They also conducted vaccinations as needed and were beginning to perform sanitary inspections. Moreover, the Surgeon General's Library was already partly organized, both for the expeditious dissemination of sanitary and public health literature and for its use in health decision-making at all levels of government.

While these activities were first and foremost organized and conducted for the benefit of Army personnel, reports pertaining to several of them were circulated to broader audiences, particularly to local officials, physicians, and civilian health professionals. As such, these programs of the Surgeon-General's Office, and after 1869 those of the Massachusetts State Board of Health, provided important native models for further post-Civil War American public health development elsewhere. They became stimuli, not only for the organization and expansion of city and town sanitary services around the United States but especially for the creation of additional state boards. They also served in some respects as examples for the scattered individuals who had begun to argue for some form of federal health bureau or agency. Previously almost unthinkable in the United States, this last concept was still a radical and debatable proposal for a nation whose health orientation up to that time had been almost entirely state and local. But some felt it could no longer be put off since there were by then so many pressing national health concerns that were outside the scope and competence of local and state authority to deal with.

Several of the Army medical officers, including some Surgeons-General, endorsed these ideas, at least in general. But it was Billings who, with his numerous professional links in civilian public health circles, proved to be especially positioned and qualified to help advance the public health movement at the national level. And for over a quarter of a century, he remained as a key player—some thought him indispensable—in the initiating, energizing and implementation of new national health bodies and enterprises. In leading those causes, Billings the military man may not have fitted the usual mold of the reformer. Yet, he served them with force and conviction. This was true even though, by his time, the motives behind public health activity were less composed of humanitarian or other social reform forces than they had been a generation earlier, and more so by other ingredients, in his case mainly by scientific, medical, and technological imperatives, but rarely by political factors.

Shaping a Federal Agency: The Profession and the Congress

When the American Public Health Association (APHA) was launched in 1872, practicing hygienists saw the body as a much needed continuation and focal point for America's approximately forty-year-old but poorly coordinated sanitary movement. In order to bring new energies to the movement, the organizers, at one of their first meetings, invited some sixty additional professionals and others, including Billings, to join them as members.¹ Billings accepted partly because of the opportunity it offered to publicize the Surgeon-General's Library among the members as well as to expand his personal network of Library collaborators and contributors. However, like many others, he also joined the Association in order to exchange professional ideas and information with his peers.

At the Association's initial meetings, Billings established what proved to be progressively useful relationships with Edward Jarvis, Edwin M. Snow, and several other senior sanitarians who had participated in the National Quarantine and Sanitary Conventions of 1857-1861 as well as with some of the participants in the wartime programs of the United States Sanitary

¹ For general histories of the movement, see John Duffy, *The Sanitarians: A History of American Public Health* (Urbana: University of Illinois Press, 1990), espec. pp. 93-192; Wilson G. Smillie, *Public Health: Its Promise for the Future* (1955), pp. 235-268.

Commission. From the beginning he also had much in common with Stephen Smith and Elisha Harris, in large part because of their leadership of New York City's celebrated sanitary reforms of the 1860s. And, as others joined the Association, he went out of his way to cultivate ties with the chemist Charles Chandler, with the sanitary engineers George E. Waring and Rudolph Hering, and with other kinds of health professionals. In fact, one of the conspicuous needs of the new society, he thought, was to attract still more engineers, lawyers, architects, and scientific specialists to balance its initial preponderance of physicians.²

The early membership of the Association included a small but growing nucleus of active local health officers and a larger number of other city officials, including members of boards of health. By the mid-1870s, ten or a dozen representatives of newly created state boards of health had also begun attending the meetings. Equally noticeable was the appearance and participation of a few representatives from federal government agencies, a particularly welcome development since no such officials had shown up at the antebellum national quarantine and sanitary conventions. The head of the newly formed Marine Hospital Service, Supervising Surgeon General John M. Woodworth, came to meetings and served on committees from the beginning, while officers of the Navy's medical department became members shortly afterward. From the Army, both Billings and Joseph J. Woodward contributed actively to the Association during these first few years, including the performing of extensive service on the Executive Committee and other committees. However, while the latter's participation waned some time after 1876, Billings's roles and responsibilities in the organization continued to expand; he was elected First Vice-President in 1878 and became President in November 1879.³

² The New York reforms are reviewed briefly in Duffy, *The Sanitarians*, pp. 118-121, but for a vivid view by one of the participants, see Stephen Smith, *The City that Was* (New York: F. Allaben, 1911). For a short recent review of Smith's career, see Gert Brieger, "Stephen Smith," *American National Biography*, Vol. 20 (1999), pp. 290-291. See also J.S.B., "The Rights, Duties, and Privileges of the Community in Relation to those of the Individual in Regard to Public Health," American Public Health Association, *Public Health: Papers and Reports*, Vol. 3 (1875-1876), p. 52.

³ These leadership and membership details of the Association are to be found in the minutes of its successive meetings. See the respective volumes of the Association's *Public Health: Papers and Reports*.

From the first, Billings proved to be versatile in his usefulness to the association. To be sure, he had no civilian experience as a local health officer or sanitary inspector. But, he brought to the discussions a degree of experience and expertise in initiating and organizing large-scale public health projects or operations that few other Americans of that period had had. Moreover, from his knowledge of the holdings of the Surgeon General's Library, he could speak decisively about the latest and most important developments in every aspect of hygiene, in Europe as well as America. Billings was additionally already known as a man of action, a "doer" who was persuasive in argument and undaunted by difficulties. His friends and allies in the Association seem to have been particularly impressed by his normally calm demeanor, supreme self-confidence, and rational approach to problems. But those who opposed his positions would have more often found him stubborn, belligerent, or unyielding.

When Billings joined the APHA, he became a participant in a vigorous world-wide discussion and debate over the causation and spread of crowd diseases or infections. Along with the other members of the Association, Billings hoped that the interchanges of shared experiences would add to their understanding of all of the communicable diseases. And with this new knowledge they looked forward to eventual improvements in the quarantines, vaccinations, environmental sanitary measures, and other disease control modes that were available to American communities, or to adjustments in their use. Divided among anti-contagionists, contagionists, and the undecided, the bulk of the membership was united only in their admitted ignorance of these matters. In fact, their vast helplessness before the crowd diseases made them feel an obligation to the public to continue trying almost every available preventive measure for as long as it seemed to hold any possibility of reducing disease and death, or as long as public opinion insisted. As a result, through this period of shifting scientific knowledge, neither Billings nor his APHA associates had much choice but to recommend sweeping very broadly in their public health measures, which meant, to some extent, the continued pursuit of environmental sanitation even if, like him, they were believers in the germ theory.⁴

⁴ For Chadwick, see Benjamin W. Richardson, *The Health of Nations: A Review of the Works of Edwin Chadwick*, 2 vols (London: Longmans, Green & Co., 1887); and Edwin Chadwick, *Report on the Sanitary Condition of the Labouring Population of Great Britain, 1842*, edited by Michael W. Flinn (Edinburgh:

The early APHA members varied somewhat in what they expected of their Association. Allies of Woodworth, for instance, wanted it to focus almost exclusively upon improving quarantine laws and practices. However, a larger segment of members agreed that, whatever else they did as an Association, they should devote themselves to the pursuit of two large interlocking objectives. The one was to design, organize, and carry out a comprehensive fact-finding survey of the nation's health and what was being done to protect and improve it. And the other was to work for the creation of some form of national health bureau or commission. By all accounts, from an early day a sizeable number of the members began deferring to Billings's expertise in these matters, and apparently with little or no discussion they went on to give him major roles in the Association's pursuit of both objectives. In turn, Billings, in or through the Association, by and large sought national health solutions that would be compatible with the interests of the Army Medical Department.

The case for a federal health organization and the one for national health fact-finding both gained significant new impetus, beginning in 1873, when a new cholera epidemic exploded across the United States. As usual, most of the responses to the epidemic, such as they were, were worked out by each individual community almost in isolation; few of the new state boards of health were yet in a position to provide much assistance.⁵ As expected, moreover, the only substantial and coordinated response that involved the crossing of state lines was that of the Army Medical Department. Throughout the 1860s the Surgeon-General's Office had monitored the successive threats of epidemics

Edinburgh University Press, 1965); and Cassedy, *American Medicine*, pp. 208-215. An important new study is Christopher Hamlin, *Public Health and Social Justice in the Age of Chadwick: Britain, 1800-1854* (Cambridge University Press, 1998).

⁵ Marcus examined several aspects of the spreading late nineteenth-century national outlook in public health. However, he failed to take into account the large roles played in this development by the Army Medical Department, the American Public Health Association, the National Board of Health, or to a lesser extent, by the Marine Hospital Service. Alan I. Marcus, "Disease Prevention in America: From a Local to a National Outlook, 1880-1910," *Bull. Hist. Med.*, (53), 1979, pp. 184-203. For a thorough study of the impact of cholera on nineteenth century America, see Charles Rosenberg, *The Cholera Years* (Chicago: University of Chicago Press, 1962), *passim*.

at the various army posts and as necessary had bolstered the resources of the latter for preventing or treating the diseases. Subsequently, Barnes detailed Woodward to compile and publish a statistical report on the Army's experience with epidemic cholera in 1866 and a similar report on both the cholera and yellow fever outbreaks of 1867.⁶ Even before the 1873 epidemic reached American shores, Barnes ordered still more extensive sanitary and therapeutic measures as well as improved reporting procedures at all of the field posts. And at an early stage he appointed Surgeon Ely McClellan to compile a comprehensive report on the course of the disease in the United States, not only in the Army posts but in the civilian communities.⁷

Following this most recent epidemic, Billings prepared and published a bibliography of the world-wide literature on cholera. He worked on this between 1873 and 1875 with his associates in the Surgeon-General's Library and in the latter year completed a document of over three hundred pages.⁸ With its publication, the public health and medical communities were afforded expanded insights into this one destructive malady. Moreover, with it, the mechanisms for similarly illuminating other epidemic diseases in the near future and circulating other public health information were now virtually all in place. Billings had already begun planning the publication of the huge subject index of the contents of the Surgeon-General's Library, a resource which eventually would provide health administrators and workers with exhaustive bibliographical information on every disease and every health and medical topic.⁹ Meanwhile, the cholera bibliography acted both as a stimulus and an adjunct to the APHA's anticipated health survey.

⁶ Joseph J. Woodward, *Report on Epidemic Cholera in the Army of the United States during the Year 1866*, Surgeon General's Office, Circular No. 5 (Washington: G.P.O., 1867); Joseph J. Woodward, *Report on Epidemic Cholera and Yellow Fever in the Army of the United States during the Year 1867*, Surgeon General's Office, Circular No. 1 (Washington: G.P.O., 1868). See also Mary C. Gillett, *The Army Medical Department, 1865-1917* (Washington: Center of Military History, U.S. Army, 1995), pp. 25-43.

⁷ Ely McClellan, "History of the Cholera Epidemic of 1873 in the United States," In *Cholera Epidemic of 1873 in the United States*, House of Representatives, 42d Congress, 2d Session, Ex. Doc No. 95 (Washington: G.P.O., 1875), pp. 1-705.

⁸ J.S.B., "Bibliography of Cholera," in *Ibid.* pp. 705-1025.

⁹ Wyndham B. Miles, *A History of the National Library of Medicine* (Bethesda, Md: National Library of Medicine, 1982), pp. 117-124.

Long before the American Public Health Association was founded, scattered physicians and government administrators across the western world agreed that the pursuit of public health required the amassing of much special information. Specifically, it became an article of public health faith that both the need for and the focus of sanitary action could only be determined by exhaustive surveying, classifying, and quantifying of environmental and other factors, both natural and man-made, especially those that appeared to contribute to excesses of ill health in any given community. In the antebellum United States, sanitary reformers and “statists” were particularly impressed by the unrelentingly systematic fact-finding processes that had evolved in England. In particular, beginning in the 1840s, they studied both the methods and the results that were detailed in Edwin Chadwick’s famous *Report on the Sanitary Condition of the Labouring Population of Great Britain*, and they were equally avid to obtain similar publications of surveys by Chadwick’s contemporaries.¹⁰ Some few of the Americans—Lemuel Shattuck, John Griscom, Erastus D. Fenner, and others—went on to draft or even conduct such surveys in their local communities. But substantial support for a coordinated national sanitary fact-finding enterprise failed to materialize until after the Civil War.¹¹

At its Philadelphia meetings in November 1874, the APHA created a committee to design such a survey. The Association chose Billings to be its chairman and selected twenty-three additional senior sanitarians to work with him as members. Over the next year Billings directed the committee’s work from his desk in Washington, a process that chiefly entailed deciding upon the main subject areas to be covered, assigning committee members to draft specific questions, and then editing a final draft. Surprisingly he made no attempt to impose his own opinions but instead let the report reflect the belief and practices of the entire committee.

It was such a report that was submitted to the Association at its fall 1875 meeting in Baltimore. The report emerged as a model questionnaire to be made available to communities that wanted to survey themselves. Exhaustive in scope, its nineteen main topical headings or survey schedules included over five hundred questions designed to elicit definitive information as to “the present condition of Public Health” and the extent of measures for its regulation in America. The members intended that for the time being the

¹⁰ Cassedy, *American Medicine*, pp. 208-215.

¹¹ *Ibid.*, pp. 208-219.

survey would be confined to towns and cities with populations of over 5,000 inhabitants; they identified some 325 such communities.¹²

The report's topics and questions strongly reflected the membership's dominantly anticontagionist beliefs with respect to the spread of disease, their concerns with climatic and topographic influences on health, and their preoccupations with urban wastes and their disposal: i.e., with drainage and ventilation of houses and public buildings, with sewers and water supplies, with the elimination of odors, and with other sanitary activities related to the environment. In deference to holders of contagionist beliefs, however, questions were also included about the organized use of quarantine, vaccination, and other measures. The committee members then differed over the question of what use the Association should make of the potential data collections and ultimately ended up making no clear recommendations. They did agree that individual communities could find much of value in the scheme, if only as a basis for discussing future plans. Moreover, it seemed evident to the committee that "until some such sanitary survey is accomplished, State Medicine in this country cannot take rank as a science, but must rest mainly upon individual opinion and hypotheses, as it now does."¹³

After considerable discussion, those in attendance at the Baltimore meeting endorsed the plan drawn up by the committee and then created a new special committee to organize and begin the work of the survey. To staff the group, they carried over many members of the original committee, including Billings, but they turned the chairmanship over to Elisha Harris. The official minutes of the meeting do not specify any reasons for that change, but it seems to have been initiated by Billings himself.

To begin its work, the APHA committee under Harris explored the possible use of maps in its future reports, attempted to test the so-called Billings committee's questions and schedules in a few sample communities, and made tentative plans to launch the full-scale survey in 1880 in collaboration with officials of the United States Census. However, between 1875 and 1878

¹² JSB, "Report of Committee on the Plan for a Systematic Sanitary Survey of the United States," *Public Health Papers and Reports*, II, 1876, pp 41-54. The only scholarly review of this project is the short paper by George Rosen, "John Shaw Billings and the Plan for a Sanitary Survey of the United States," *Amer. J. Of Public Health*, Vol. 66, No. 5 (May 1976), pp. 492-495.

¹³ JSB, "Sanitary Survey," *loc. cit.*, p. 44.

tangible progress of any kind was badly stymied by a nationwide economic recession. In 1877, Harris thus had to confess that the survey project was still marking time pending realization of three desiderata: the creation of a federal public health office or bureau that might coordinate the survey; the creation of boards of health in every state to actually conduct local segments of the survey; and the obtaining of fiscal support.¹⁴

Billings, meanwhile, had come to the decision that he had to repudiate much of the plan that his own survey committee had drawn up. At some point in the process, he realized that he had come to look at the purposes and contents of sanitary surveys in a totally different way than most of his committee members did. He did agree with them that America's cities and states would unquestionably benefit to some extent from the standard sanitary surveys of the day just as much as English and European communities had benefitted in previous decades. Yet, even as the committee completed its deliberations in 1875, he was thinking of ways to move beyond what was a highly traditional and limited type of survey. Accordingly, he turned his presentation of the committee's plan at the Baltimore meeting into a strong proposal for modifications and additional ingredients that he thought were essential for future surveys.

Arguing from history, Billings noted that his committee's survey plan actually promised only marginally greater usefulness, if any, than previous American plans of this character had achieved. A major reason, he maintained, was that, even though all but one of his committee members were physicians, the plan included little that would be of interest to the bulk of the medical profession. As such, it was an incomplete, one-sided inquiry. Despite the immense store of facts about America's sanitary topography that it was intended to pull together, he concluded, "the medical part has been left out." Moreover, the likelihood seemed strong that, unless actual survey teams raised their sights, replies to the 1875 survey questions might well, as in past surveys, end up dealing with "only one form of disease, the malarial," and that only in "vague and general" terms.¹⁵

"The one great object of medical topography" or of sanitary surveys, Billings asserted, should be the investigation of the causes of disease. However, up to that time, as he reminded his peers in the APHA, in the

¹⁴ See minutes of annual meetings for 1875-1878, *Public Health Papers & Reports*, volumes II-IV.

¹⁵ JSB, "Sanitary Survey," *loc. cit.*, p. 51.

United States only the Army Medical Department had done much of significance along that line. The Department had been unique in collecting factual information about disease as well as about mortality, and its long continued attempts to correlate those data with meteorological information at the various posts were, despite their inconclusiveness, the most valuable American contributions yet made to the study of disease etiology. Thus, any future sanitary survey should similarly include searching questions about diseases as the core of its inquiries. Moreover, in order for them to have teeth, future inquiries into the nation's health had to seriously enlist the methods and findings of the sciences so that "vague generalities and opinions [can] be replaced by specific information." As another crucial part of the process, the medical profession had to be enlisted and intimately involved far more than it had yet been. Finally, to become at all complete and effective, the entire survey operation seemed to require the involvement of some form of federal health agency or bureau.¹⁶

While the early members of the American Public Health Association had some enthusiasm about the project for a national sanitary survey, they were initially less interested in working for some vaguely distant federal health agency. After all, most of them were first and foremost heavily committed to getting their city and state health departments off the ground. However, many became more favorably inclined toward the idea of a national agency during the 1870s, partly after hearing the persuasive arguments of a handful of their colleagues but particularly following the outbreak of a devastating new epidemic of yellow fever.

Billings's views on the matter were expressed in various ways and to different audiences. As early as 1866 he confessed to having had a daydream in which he "got very enthusiastic all by myself over the Utopian idea of making the Surgeon-General head centre of the medical profession" of the United States, and he may well have ultimately thought of himself as an equally suitable person for such a job.¹⁷ However, within a few years he was asserting in public his conviction of the imminent need for a federal health body. In 1869 he and Barnes maintained before Congress that the "large medical library" they were creating would be an essential element in forming and carrying on the work of such a body. By the mid-1870s Billings

¹⁶ *Ibid.*, 50, 51, 53. For further references to the Army statistics, see chapters 2 and 5.

¹⁷ Quoted in Garrison, *Billings*, p. 146.

was letting it be known that the Surgeon-General's Library's collection of sanitary reports and other public health documents had already become fully adequate to support the needs of a national health organization. And in his 1870 reports to the Secretary of the Treasury he had discussed his ideas about the likely relations of the proposed Marine Hospital Service to a broader national health agency.¹⁸

During the 1870s Billings gained increased opportunities to exchange views on these matters, not only at the APHA but in the American Medical Association's newly founded Section on State Medicine and Public Hygiene. A broad range of opinions and proposals emerged in these circles despite the well-known limits that the United States Constitution placed on federal activity in health-related matters. In the AMA, several prominent hygienists, particularly A. N. Bell and Henry I. Bowditch, came up with comprehensive and influential schemes. But in the final analysis they concluded, as did Billings, that, for the time being any such bureau would be premature. This position rested chiefly on the fact that state boards of health, which would have to lead the sentiment for a national body, were still few and limited in powers. Moreover, the public, whose concurrence would be essential, was still uninformed about the issues.¹⁹

At the APHA, some agreed with Bowditch, while another group continued to follow the ideas of John M. Woodworth, who had been effective in lobbying Congress for the buildup of federal quarantine functions in his Marine Hospital Service and was hopeful of expanding in other directions. However, a larger proportion of the members, especially the active sanitarians, remained skeptical of the value of quarantine, except as a last resort, and a good many seriously questioned Woodworth's exclusively contagionist premises. These members responded more favorably to other advocates of national health legislation, among them Christopher Cox, Stephen Smith, Dorman Eaton, and Billings, though there were still other

¹⁸ John Shaw Billings, "The National Board of Health and National Quarantine," in American Medical Association, *Transactions*, Vol. 31 (1880), pp. 435-455.

¹⁹ See discussion in Smillie, *Public Health*, pp. 306-310. Billings seems to have been especially influenced by Bowditch's extensive survey of the individual states and by the latter's effective organization and direction of the first fully operative American state health department, in Massachusetts. Henry I. Bowditch, *Public Hygiene in America* (Boston: Little, Brown, 1877).

areas of disagreement.²⁰ Some wanted a strong federal office with permanent professional staff that could perform an extensive range of preventive activities, including quarantine if appropriate. Others, however, including Billings, preferred a mainly advisory body of experts, at least to begin with. This segment agreed that some such office was needed on a continuing basis, as much between epidemics as during them. They did not urge copying any of the various types of central public health agencies that had been developed in Europe. But they did want a body with enough authority and expertise for carrying out an effective national sanitary survey and for shaping statistical and health information systems. Equally desirable was the conduct or stimulation of studies of the causation of disease and the development of other health-related research. Likewise, most expected such an office to promote the creation of public health boards in every state and to support the extension of local environmental sanitation programs.²¹

During the same period Congress extended its own parallel consideration of national health measures and institutions, though with often different priorities. The prime interest of the lawmakers in the early and mid-1870s was in working out a national quarantine system, though the sanitary and medical societies increasingly urged them to consider some broader form of sanitary bureau or agency. In the summer of 1878, a new epidemic of yellow fever that struck much of the South and the Mississippi basin brought a powerful new sense of urgency to these discussions. It also accelerated the emergence of political and other divisions in the debates over new health legislation.

Polarization of the public health community was especially evident from the mid-1870s on, when Billings and Woodworth began staking out increasingly conflicting positions with respect to such legislation. And it solidified as each of these strong personalities began to perceive the other as a formidable rival and obstacle, someone standing in the way, not just to obtaining a particular kind of legislation but to dominating any national agency that might be created. One episode illustrates the adversarial relationship that had developed. Late in 1878 Woodworth was the intended beneficiary of a national health bill introduced in the Senate by Senator

²⁰ See *Ibid.*, pp. 301-306; Duffy, *The Sanitarians*, pp. 163-167.

²¹ Billings outlined his preferences to other APHA officers at several points, but see his letter of mid-December 1878 to Dr. C. B. White of New Orleans, in JSB Papers, NLM.

Lucius Q.C. Lamar of Mississippi. Comprehensive in scope, the bill proposed a federal health department that would not only administer a national quarantine system and perform standard sanitary and epidemiological activities but also incorporate the current Marine Hospital Service operations and personnel. Focussing on this latter provision, Billings and his supporters immediately identified the bill as a dangerous attempt to place Woodworth, whom they had come to regard as unacceptably power-hungry, in control of Lamar's entire projected scheme, and they managed to get it pigeon-holed. As it happened, many Senators, still uneasy about any broadening of federal health activity, were all too willing to quash the bill anyway, just as they did many of the period's other health proposals.²²

²² For one illustration of Billings's strong feelings toward Woodworth, see JSB to Elisha Harris, 12/14/1878, JSB papers, NLM, box 10.

Historians have given considerable attention to these political, professional, and personal conflicts. Among the most useful works are Wyndham D. Miles, "A History of the National Board of Health, 1879-1893," 2 vols., an unpublished manuscript dated 1970 in the National Library of Medicine, chapter I (pp. 1-36); Peter W. Bruton, "The National Board of Health," Ph.D. Diss., University of Maryland, 1974, pp. 50-165; Bess Furman, *A Profile of the United States Public Health Service, 1798-1948* (Bethesda, Md.: National Library of Medicine, 1973), pp. 121-149; Margaret Humphreys, *Yellow Fever and the South* (New Brunswick: Rutgers University Press, 1992), pp. 55-110, *passim*.; John H. Ellis, *Yellow Fever and Public Health in the New South* (Lexington: University Press of Kentucky, 1992), pp. 60-82; Robert H. Kohler, "Sanitarians, Engineers, and Public Science in the Gilded Age," *Minerva*, Vol. XXXI, No. 2 (Summer 1993), pp. 184-210, *passim*.

Of these works, the Miles study, though never quite finished or published, remains the most thorough and useful examination to date of the National Board, not only of its specific program activities but of its highly contentious legislative history. The Bruton work provides a fuller background of public health history. Furman, in turn, interprets the political developments and personal conflicts from the point of view of Woodworth, who died in 1879, and the interests of the Marine Hospital Service. While her treatment is interesting and useful, there remains a need for a much fuller and less disputatious account of the Woodworth-Billings relations as well as of Woodworth's larger role in American history. The Humphreys and Ellis volumes illuminate the National Board rivalries and issues in the context of the 19th century yellow fever

Following this incident Woodworth lost much of his influence in the American Public Health Association, leaving Billings as the principal spokesperson of the body's efforts to obtain national health legislation. Already, during the mid-1870s, the latter had worked toward that goal from his seats on the Association's Executive Committee, the Sanitary Survey Committee, and other committees. Now, at the Richmond meeting in November 1878, Billings gained additional leverage as the Association's vice-president. He also earned a seat on the body's newly created Advisory Council on National Sanitary Legislation. The Council in turn empowered a three-man executive committee to pursue the cause of national legislation with the utmost urgency during the period before the next APHA meeting. With Billings on this committee were the Washington physician and former APHA President Joseph M. Toner and the New York attorney Dorman Eaton, highly respected for his contributions in shaping New York City's path-breaking sanitary legislation of the 1860s. During the next six or more months, these three individuals virtually lived in the U. S. Capitol building, lobbying for the cause of a national health bureau and working with individual congressmen in the attempt to obtain a compromise bill that both the lawmakers and the sanitarians could accept.²³

epidemics. Both works are particularly valuable in detailing the activities of southern congressmen and physicians who became backers of Woodworth.

Finally, Kohler's article, while flawed in some respects, is a highly original and stimulating examination of the National Board's scientific setting and its political struggles, and it deals penetratingly with the causes of the Board's demise. However, it needs qualification, I believe, in its portrait of Billings as a loose cannon or power-hungry bureaucrat in the federal government. Actually, through his long military career, Billings remained scrupulous about doing things through channels, observing red tape as necessary, keeping the Surgeon General informed of his plans, and working with existing organizational hierarchies, committees, and chains of command. For another view of the federal government and its components during this period, a surprising number of which touched on Billings's career, see the classic study by Morton Keller, *Affairs of State: Public Life in Late Nineteenth Century America* (Cambridge, Massachusetts: Belknap Press of Harvard University Press, 1977), *passim*.

²³ Drawn from various Association reports in *Public Health Reports and Papers*, Vols. II-IV, 1874-1878. Billings's preferences for a particular form of national health organization during these years were undoubtedly shaped in part by

The legislation that finally emerged in several installments in the spring of 1879 from these hectic joint efforts of Congress and the public health association was far from ideal for anyone. Some saw it as a blatant abdication of congressional responsibility for health, but others recognized it as the best that could be expected from a succession of difficult compromises. In lieu of the comprehensive and permanent federal department of health that some had wanted, Congress settled on a part-time council called the National Board of Health and effectively limited it to a life span of four years. The initial legislation was fairly close to creating the limited agency favored by Billings and other sanitarians, one empowered to perform extensive advisory and information gathering functions, public health research, and a few other activities. However, within a short time, supplemental legislation heavily burdened the new Board with a cumbersome and controversial quarantine support system that most members originally had little enthusiasm for. Equally damaging, while the new laws made the Board responsible for reducing the country's burden of disease and epidemics, they allowed it little authority as well as scant fiscal resources for attempting anything except quarantine. Moreover, they made no provision for an executive office and manager. Nevertheless, it represented a start, and as such most of the public health community seemed anxious to make the most of it.²⁴

Federal Health Officer by Default: Billings Runs the Board

To no one's surprise, President Rutherford B. Hayes's list of eleven selectees for the Board included Billings in the slot assigned to the Department of the Army. At their first meeting the members selected James L. Cabell, the current President of the American Public Health Association, as President of the Board, Billings as Vice-President, and Thomas J. Turner, Medical Inspector of the Navy, as Secretary. Named with these officers to the executive committee were Stephen Smith of New York and Preston H. Bailhaiche, a surgeon with the Marine Hospital Service. The remaining members included the prominent physician-sanitarians Henry I. Bowditch of Boston and Samuel M. Bemiss of New Orleans, three lesser known sanitarians—Hosmer

his service on a series of other Congressional boards of sanitary experts. See discussion in Chapter 5.

²⁴ For details, see Duffy, *The Sanitarians*, pp. 166-168; Miles, "National Board," pp. 32-66; Bruton, "National Board," pp. 152-164.

A. Johnson of Chicago, Robert W. Mitchell of Memphis, and Tulio S. Verdi of Washington, D.C.—; and a Justice Department attorney, Samuel F. Phillips. Most of these individuals remained throughout the contentious, often hand-to-mouth, and sometimes productive first three years or so of the Board's existence. And it was Billings who, by default as much as through ability, dominated the Board's work in those years just as he had dominated its formative period in the APHA.

Of these original members, the two who came with the best professional credentials proved to be of only limited or brief value to Billings and the work of the Board. The capable and widely respected New York sanitarian, Stephen Smith, found himself unable to attend very many of the meetings of the Board's executive or other committees. Actually, the historian has to wonder if Smith in reality was unwilling to attend. By that point in time, though there is no factual support for the supposition, it would have been surprising if he had not built up considerable resentment over a series of Billings's public health successes that came, at least partly, at his (Smith's) expense. Billings had prevailed over Smith in the design competition for the Johns Hopkins Hospital. He had effectively pushed Smith, the founder of the A.P.H.A., aside in the Association during the intense political and professional debates of the mid-1870s. Moreover, in 1879, when the Billings-led sanitarians had prevailed over Woodworth's forces in obtaining a board with only limited powers from Congress, it was equally a defeat for Smith, who had wanted and still wanted a strong national health agency immediately. Subsequently, it cannot have been pleasant for him, as an avowed friend and supporter of Hamilton, Woodworth's successor at the Marine Hospital Service, to sit at Board meetings that were so thoroughly dominated by Billings.

By contrast, Henry Ingersoll Bowditch came to the Board as Billings's closest and much admired professional role model in public health. Billings valued the other man's important research in hygiene. In the context of the Board, however, he especially appreciated the latter's unique accomplishments and authority, among Board members and public alike, as Chairman of America's first effective state board of health. The two men shared similar objectives and timetables for public health, and with their wives they sought out each other socially as often as possible. Bowditch's resignation after less than a year, apparently due to illness, was thus a heavy blow for Billings. Writing his regrets, the latter hoped that the President would consult Bowditch about possible successors so the Board would obtain someone of comparable sanitary competence as well as strength of

character. In fact, he added, "The Board is much in need of two or three men who really study and know something of sanitary science instead of devoting themselves to legal and states rights and other similar questions, and being guided by MCs [Members of Congress] as to what they ought to do, instead of stating what ought to be done and leaving MCs to take the responsibility of doing it or not."²⁵

Unlike some of his contemporaries, Billings pragmatically accepted many of the built-in imperfections of the Board with relatively little protest. He welcomed the challenge of getting the new agency started, and he was ready to work for changes as they became necessary. Well prepared by the assignments he had had in the Army Medical Department, he was confident in his abilities to solve problems and get things done, as long as he had adequate support. At the same time, his part-time status with the Board appeared to suit him just fine, particularly in making possible his continuing commitments to the Surgeon-General's Library, the Johns Hopkins Hospital and Medical School, the APHA, and other institutions. Ever the consummate juggler with his time, he seems to have kept everyone happy by somehow managing to avoid short-changing the interests of any.

The Board as a whole held its first meeting in April 1879. At that time it organized and announced itself to the public, set up its office in Washington, established committees, and got started on priority matters. From the first, the members reportedly took their responsibilities seriously, and most of them proved to be both able and hard-working at their regular meetings, each of which lasted as much as a week or more. However, these were all individuals with full-time medical practices or other occupations that tended to cut their attendance down. Moreover, the full Board was required to meet only twice a year regularly or on special occasions, leaving the executive committee to manage most matters in the interim. In turn, the executive committee itself was often depleted, with the President, Cabell, being only sporadically willing or able to interrupt his medical teaching and practice in Charlottesville, Virginia, to make the trips to Washington. In his frequent absences, Billings as Vice-President presided over the meetings.²⁶

From the beginning, accordingly, with not just the tacit concurrence but the urgent insistence of most of the rest of the Board, Billings steadily built up an even larger informal role for himself, one that had not been provided for in

²⁵ JSB to Bowditch, 1/18/1880, JSB papers NLM, box 11.

²⁶ Miles, "National Board," pp. 37-49.

any legislation. This was as *de facto* chief executive officer of the agency. With his broad professional and institutional connections as well as his permanent geographical base in Washington, he was in a position to do many things for the Board that other Board members could not feasibly perform, even if they wanted to. In taking them on, he thus emerged variously as a forceful goad, facilitator, and trouble shooter; as a person who tied things together and generally ensured the continuity of the Board programs and operations. Contrary to some other historical opinion, it seems to me that Billings, in playing out this necessarily assertive role, was fundamentally attempting to strengthen the Board as a whole rather than to aggrandize himself. Besides, there were too many other strong-minded individuals in the organization to allow the latter; and even the most persuasive Billings opinions were by no means always seconded by the majority.²⁷

Working primarily from his desk in Washington, then, and in many matters in close tandem with Thomas Turner, the organization's secretary, Billings provided an essential administrative focus for the National Board of Health's country-wide effort during the period up through August 1882. During that time he applied his energies to three large areas or phases of the Board's affairs. First of these was the continuing management of legislative relations. In Cabell's absences but bolstered by whatever other members were available, Billings almost invariably led the sessions of defending and explaining Board activities, needs, and budgets to Senate or House committees as well as to individual congressmen. He was the member who drafted most of the new bills for congressional consideration and who did much of the lobbying for increased statutory authority and other supplemental health legislation. And through 1879, pursuant to the March 3 law, he assumed much of the task of working with outside sanitarians, physicians, and the National Academy of Sciences on a plan for a permanent federal public health agency. Echoing his views after the Board's first few months in existence, all of these groups ended by recommending that the Board format be continued indefinitely.

In a second area of Board activity, Billings took on several essential tasks of communications and public relations. He went to considerable lengths,

²⁷ I base these observations as well as those on the following pages heavily upon my readings in the Billings papers at the National Library, particularly his National Board of Health correspondence between 1878-1882. See NLM, MS, Film 4. See also, Furman, *op. cit.*; and Kohler, *loc. cit.*

first of all, to help create and maintain a mutuality of understanding with his colleagues on the Board with respect to their joint tasks. Accomplishing this involved such things as preparing agendas and briefings, reinforcing the members in their controversies with antagonistic officials or other persons, exhorting those whose spirits were flagging, and sometimes taking one or more of them to the Gay Street home for evenings with his wife and family. He made a special point of writing frequent detailed letters to Cabell, the often absent President, to keep the latter informed of Board developments. But that was hardly exceptional, for between meetings Billings was constantly writing letters or sending telegrams to all of the Board's members and agents as well as to its many actual and would-be collaborators around the states. Highly focussed on the particular business at hand and with a minimum of small talk, he used his letters effectively for coordinating, consulting, sending instructions, or otherwise maintaining the ties essential in keeping the enterprise going. Added to his already extensive communication networks with military, medical and public health contacts, this continuing barrage of correspondence in both directions became one of the major ingredients, the glue, in keeping alive a strong commitment of sanitarians and local officials around the country to the aims and programs of the Board between 1879 and 1882.²⁸

Billings was equally careful to maintain communication channels with his professional organizations and to keep the sanitary and medical press informed as to the Board's plans and programs. Critical articles or editorials sometimes had to be responded to. And, far from least important, he had to keep an eye on the movements, pronouncements, and intentions of John B. Hamilton, who, in March 1879, succeeded Woodworth as Surgeon-General of the Marine Hospital Service. Fully as much as Woodworth, Hamilton came to resent Billings's successes in obtaining creation of the National Board of Health, and he made little secret of his hopes of undermining the Board and getting Congress to assign its functions to his own agency.²⁹

²⁸ See Billings papers, NLM.

²⁹ For the Marine Hospital Service and the National Board of Health during the Hamilton years, see Furman, *op. cit.*, pp. 151-198. But compare Bruton, "National Board,"; and Miles, "National Board," *passim*. For Woodworth, see Margaret Humphreys, "John Maynard Woodworth," *American National Biography*, Vol. 23, pp. 836-837. For Hamilton, see Shari Rudavskt, "John Brown Hamilton," *American National Biography*, Vol. 9, pp. 923-925.

The third area of Billings's concern was the coordination or management of the Board's actual programs and activities. As an officer and member of the executive committee he was above all, from the beginning, continually involved in planning, shaping, and overseeing the Board's central responsibility, its large maritime quarantine support activity with the states, along with related infectious disease assistance. This was work that had to be launched almost immediately in the summer of 1879, only a few weeks after the Board's formation, when the yellow fever returned to America. With his colleagues, Billings thus organized and put a network of inspectors in place along the Atlantic and Gulf coasts and the Mississippi River, and then monitored the latter's work. They expanded their links with local and state health officials and began distributing funds to aid such activities as identifying cases of yellow fever and attempting to limit their spread. He was one of those who worked out details with the State Department for distributing disease inspection forms to consular offices abroad and made arrangements with the Treasury Department for distributing funds to eligible recipients. In turn, more often than not, he became involved in such matters as advising local and state officials how to apply for such funds, in working with them to settle political or jurisdictional health disputes, and in obtaining regular vital statistics reports from them. Moreover, with his colleagues on the Board, he was in increasing demand from legislators, educators, health professionals, and others for information about hygiene, sanitation, and public health.

While the lion's share of Congress's appropriation for the National Board of Health went expressly to reinforce state and local quarantine efforts, small but important amounts were also available for certain other purposes. These mainly had to do with the advancement of public health through scientific research and the gathering of quantitative information, both of them strong professional and scholarly interests of Billings. Accordingly, throughout his service on the Board, he expended a great deal of energy, both in trying to protect and enlarge whatever funds had been allocated for such projects and in the processes of planning and carrying them out.

Billings got the Board started particularly quickly on a small program of support for scientific investigation, and the other members seconded him strongly in this. He was instrumental in enlisting his Johns Hopkins associate, the chemistry professor, Ira Remsen, to undertake several investigations, among them an analysis of organic particles in the air. The Board also made grants to George E. Waring for investigations of household plumbing devices; to Horatio C. Wood for a study of diphtheria; to William F. Whitney

for malaria research; to Rudolf Hering for a survey of European sewage systems; and to an assortment of other individuals. None of the projects produced major scientific breakthroughs, but several made useful additions to knowledge, while the program as a whole served to advertise Billings's conviction of the pressing need for a far greater expansion of research in American public health.³⁰

On a level by itself was an 1879 proposal of the English scientist John Gamgee. Gamgee requested congressional support to build an experimental refrigerating ship as a possible alternative to the disinfection of ships during yellow fever epidemics. Evaluating this request in a time of public alarm stirred by the disease, Billings and his Board colleagues found the proposal neither ridiculous nor technologically unsound. Since even a failure could substantially add to man's knowledge about the sources and behavior of yellow fever, they recommended "that the experiment should be tried." However, Congress ultimately failed to provide the necessary financial support.³¹

Of far more immediate interest to the Board was the organization and work of its Havana Yellow Fever Commission. The idea for such a commission, broached late in 1878 by a congressional board of experts, had been examined that same year by a special APHA committee chaired by Billings and expanded by the latter to include a comprehensive scientific investigation of the circumstances and causes of the disease. Now, on the National Board's executive committee, Billings took an active part in drawing up guidelines for the commission, in staffing it, and in guiding its work throughout its duration.

With the New Orleans physician Stanford Chaille as Chair, the commission carried on its investigations in Havana through the summer of 1879 and then returned to the United States. Although the commission also included another physician, Juan Guiteras, along with a civil engineer, a photographer, and others, its key member, at least so far as Billings was concerned, was the Army surgeon, George M. Sternberg. A fellow career medical officer of Billings, Sternberg had gained an intimate knowledge of yellow fever during service at various small army posts, had begun to be recognized as an expert through his writings on the disease, and in 1879 stood out as one of the tiny coterie of American medical individuals who

³⁰ See review in *Ibid.*, pp. 352-421.

³¹ *Ibid.*, pp. 487-502. The quotation is on p. 492.

were beginning to explore the possibilities of bacteriology. Billings personally invited Sternberg to join the operation, persuaded Surgeon-General Barnes to detail him to the Board on extended service, and then monitored while strongly supporting the project.³²

In Havana, though given the title of Secretary of the Commission, Sternberg was actually principal microscopist and laboratory chief, aided by Guiteras. In his early letters from that city to Billings, he wrote about his relations with the other commission members and described problems encountered in setting up his laboratory. Later he gave details of his experiments, sometimes on animals, and his uses of micro-photography. In August, 1879, Sternberg sent Billings a bundle of cigars and acknowledged the late arrival from Washington of a shipment of Spencer lenses and other microscopy equipment. Several times he mentioned his high esteem for Turner and expressed thanks for the home office's help to the commission. In mid-September, tired out, he wrote that the commission was about ready to leave Havana. He confessed that his searches for the causative organism of yellow fever had been essentially negative, concluding that whatever he had accomplished to date would be "principally in paving the way for future investigations."³³

Back in the United States, Sternberg remained on detail to the Board for almost two more years, dividing his time up to August 1881 mainly between Washington, Baltimore, and New Orleans on a group of ongoing laboratory studies, several of them of major importance. Under Billings's and the Board's direction, he studied and made photomicrographs of the blood of yellow fever patients; searched for disease-related organisms in the dust of cities; tested the efficacy of disinfectants; performed microbiological analyses of water; and tested and disproved claims of Klebs and Tommasi-Crudeli of having isolated the causative bacillus of malaria. During his time in New Orleans, he complained to Billings about the irregularity of mail service and the generally filthy condition of the city. But he also kept Billings fully apprized of every step in his investigations,

³² A full modern biography of Sternberg is much needed. However, see Martha L. Sternberg, *George Miller Sternberg: a Biography* (Chicago: American Medical Association, 1920).

³³ Sternberg to Billings, five letters written between 4/10/1879 and 9/12/79, in JSB Papers, NYPL. Quote is from letter of 9/12/79. See also Miles, "National Board," pp. 359-363, 369-374.

asked him for copies of European articles on malaria, and pressed him for more and better research instruments, which the latter almost always managed to produce. In April 1880 Sternberg informed Billings of several lectures he was preparing for New Orleans medical groups; in reply, the latter cautioned Sternberg against divulging too much of his malaria research on those occasions, and urged him to save the bulk of his findings for the official publications of the Board.

Likewise in the spring of 1880, Sternberg wrote Billings about his increasingly close relationships with Bemiss, then the Board's chief representative in New Orleans, and about the latter's often frustrated efforts to work out cooperative quarantine measures with the city and state officials. He also noted Bemiss's fears of the likely selection of Joseph Jones as the next President of the New Orleans Board of Health, adding his own conviction that the move would be highly unfortunate and disruptive from the National Board's view. By fall, with Jones well entrenched as President, Sternberg's letters were documenting the full effect of the other man's hostility to the Board and its operation in New Orleans. In turn, the press had swung around to almost total opposition to the Board, while Bemiss had been personally villified to a point where he had lost much of his effectiveness.³⁴ And Sternberg himself had come under violent attack from officials and press alike for reporting new cases of yellow fever nearby. In a September letter to Billings he reported that he felt virtually under siege but that he was strong enough to weather the situation: "It requires a considerable amount of enthusiasm for the advancement of science to bear the abuse of the newspapers, to work with the microscope all day, and to fight mosquitoes all the evening." This was the sort of response that Billings, himself with a pronounced combative streak, liked to hear from his associates.³⁵ However, it led to Sternberg being transferred to San Francisco, where he was unhappy with the poor research facilities.

Fully as pressing as the Board's laboratory research activities, and almost as extensive, were its projects for collecting quantitative public health information of various kinds. Such data were sought to justify and give direction to the other activities. Billings thus attached central importance to Turner's labors of amassing and publishing such information, both local

³⁴ Sternberg to JSB, 2/14/80; 3/17/80; 4/4/80; 4/8/80; 9/11/80; 9/23/80; 10/18/80; all in JSB Papers, NYPL.

³⁵ Sternberg to JSB, 9/23/80, JSB Papers, NYPL.

and foreign, for the Board's weekly *Bulletin*, and he pushed steadily to help improve its coverage.³⁶

Billings and his colleagues carried a final health information enterprise over to the Board directly from its beginnings within the American Public Health Association. Almost everyone concerned thought that, with the establishment of the Board, the national sanitary survey would gain a new lease on life. In one of their early meetings the Board members thus designated some funds to be used to stimulate local interest in and adoption of the survey. With Billings's intercession, the Board then gained the use of the APHA's elaborate survey questionnaire, printed portions of it, and distributed copies widely around the United States. Despite this effort, the sanitary survey remained more admired than implemented. Some sanitarians undoubtedly felt that, with the results available of Henry I. Bowditch's far less detailed personal survey, conducted by mail in 1876, the Board's definitive type of project was no longer as pressing as it had been. Moreover, it was complicated, time-consuming, and costly as a public health tool; reportedly, only 15 or 20 towns went to the expense of conducting the official plan on their own. Moreover, due to the Board's limited budget, even fewer communities could be awarded subsidies for sanitary surveys. Among that handful, Baltimore and New Jersey health officials each received small grants, while Memphis, which in the fall of 1879 was trying to recover from another devastating yellow fever epidemic, was awarded a substantial showcase grant of \$5,000.³⁷

In the case of Memphis the Board designated a special survey committee composed of Billings as Chairman, H. A. Johnson, and Robert W. Mitchell. Beginning in August, 1879, the three began working together to obtain the necessary collaboration of local officials and to plan the work to be done. Mitchell, an attractive and energetic Memphis physician with whom Billings had much in common, organized and directed the actual house-to-house inspections, data compilations, and followups that were carried out in the fall and early winter by local officials and physicians. Billings took on himself the task of enlisting outside experts to advise and assist the committee with technical matters, and with the tacit understanding that the experts might feel

³⁶ I examine the Board's large role in improving and energizing American vital statistics in chapter 7.

³⁷ Bowditch's survey is given in detail in Bowditch, *Public Hygiene*. However, for the limited success of the Board, see Miles, "National Board," pp. 422-438.

free to go beyond the fact-finding mission of the committee by helping with the planning and even participating in designing and installing some elements of a modern sanitary infrastructure for the city of Memphis. The individuals whom he brought in included the sanitary engineer George E. Waring of Newport and New York; Charles F. Folsom, Secretary of the Massachusetts Board of Health; Major W.H.H. Banyard of the Army Corps of Engineers; and the Army medical officer Charles Smart, a leading water chemist.³⁸

Billings and his Committee visited Memphis several times during those months. In addition to overseeing the survey details, they watched over and as necessary prodded the local processes of sanitary reform. The planning and beginning of a sewer system, construction of which was contracted out by the city to Waring and begun in 1880, was naturally of central importance. But it would be some time before that large project could show much in the way of results. It was thus of particular importance when some of the other sanitary activities begun by the local community during this time—the improvements in housing and street cleaning, publication of water analyses, removal of garbage and outhouse wastes, and so on—began to take effect enough to silence local critics of the survey's methods. Their implementation also began to raise the morale of the people of Memphis and dissipate the fears that had run rampant during the epidemic. Ultimately, as the improvements took form, those concerned in the process, though especially the outsiders, came to have status almost as heroes in some residents' eyes. As early as November of 1879, the city's legislators, businessmen, and other prominent citizens organized a dinner of thanks for the National Board's committee and its experts. And in January, after another Billings visit, a Memphis newspaper editorial suggested that he was the person most responsible for "the present reassuring prospect for the sanitary regeneration of Memphis," at least for providing something of "a moral tonic, which has invigorated and strengthened every one engaged in the work of rehabilitating the Bluff City."³⁹

³⁸ John S. Billings, "Report of the Committee Charged with Making a Sanitary Survey of Memphis, Tenn. In *Annual Report of the National Board of Health, 1879*, (Washington: GPO, 1880), pp. 416-441; JSB, "Report on Sanitary Survey of Memphis, Tenn.," *Annual Report of the National Board of Health, 1880* (Washington: GPO, 1881), pp. 602-617.

³⁹ *Memphis Appeal*, 1/18/1880; *Daily Memphis Avalanche*, 11/29/79. Copies of both clippings are in the National Library of Medicine manuscript collection, MS Film 25, Reel 56, Vol. III.

Congressional Abdication of Health Responsibility and its Sequel

The Memphis operation was clearly a matter of satisfaction for Billings and the rest of the Board. But they had no reason or opportunity to rest on its laurels, real or imagined. This locale was only one among many that needed similar help after the epidemic, and the Board's limited resources remained only a fraction of what it could have used nationwide. What resources it would have in the future could not be predicted.

In June 1880, Billings touched on this question and related matters in an address at the New York meeting of the American Medical Association. He reminded his listeners of the limited powers of the Board and its vulnerability to political whim, and he alluded to the constant uncertainty hanging over its deliberations and work. He recalled that the Board had been created prematurely and in a crisis situation, i.e. "forced into existence" by the fears stirred up by yellow fever. And he wondered whether, now that the epidemic had subsided, "it would find itself without the support of an educated public opinion," which was essential to all such government organizations. He was as aware as anyone that, while the Board at that particular moment seemed "healthy and lively, . . . it would be rash to make any prophecies as to its immediate future, since this depends so largely upon the contingencies of the next few months."⁴⁰

Events of the next few months indeed produced ever more serious questions about the Board's health and left further hard-to-ignore clues that there would be no long-term future for the Board. Specifically, a combination of factors during the early 1880s set in motion a steady decline in the Board's fortunes that proved to be very largely beyond the capacity of anyone to halt. The most influential factor was the apparent end of yellow fever in the years after 1880 as an immediate public health threat and with it, as Billings well understood, a sharp dropoff of popular support for federal disease containment efforts. At the same time, the hostility of Jones and his allies in New Orleans completely crippled the Board's efforts to organize a cooperative quarantine in the lower Mississippi and Gulf region. In the process, the formers' vitriolic and uncompromising opposition began to spread outside New Orleans to newspapers and politicians in other parts of the lower South and elsewhere.

⁴⁰ JSB, "National Board and National Quarantine," *loc. cit.*, pp. 19-21.

Influenced by these and other factors, including a still-intransigent states-right's sentiment among many lawmakers and the remarkably effective lobbying of Hamilton and the Marine Hospital Service, Congress in 1880 began reducing its already slim appropriations for the Board despite numerous letters of support from health boards around the country and renewed petitions from medical and public health organizations. With each new reduction of funds the Board had to cut back some part of its operation, painful developments that most members accepted in frustration and anger over what they regarded as a congressional abdication, chiefly in the House, of its own previous commitment to national health. Starting in 1881 Billings was occasionally heard wondering about or threatening resignation, and most of his friends tried to talk him out of such a step. George Sternberg, however, after affirming that the other's resignation would "be a serious loss to the Board and to the country," stated the hope that Billings, if or when he ever resigned, would use his influence to have himself, Sternberg, appointed in his place.

Billings did resign in August 1882 after a particularly deep congressional cut left the Board with barely enough funds to keep the Washington office open. Surgeon Charles Smart rather than Sternberg was chosen to replace him as the Army representative on the Board. Congress ended most of the Board's statutory powers the following year but continued to finance a few small-scale services for a short time. Even those were terminated in 1886, though the Board itself retained a nominal existence until 1893.⁴¹

Even as the Board's powers petered out, more than a few individuals, not only in Congress but among health professionals and segments of the American public began expressing their anger and regret over the abolishment of what they regarded as a basically useful and needed agency. To many, the Board's only substantial fault had been that it had been premature. Despite its statutory limitations, they saw the record of its initiatives as evidence of what could be accomplished for large scale public health in the United States when guided by competent experts and managers. Moreover, they saw that its very existence had given a major stimulus to the revived public health movement at all levels of government, especially to the creation of additional state and local boards of health and to the refinement of their technical and scientific programs.

⁴¹ The decline of the Board is thoroughly chronicled in Miles, "National Board," pp. 80-241; and in Bruton, "National Board," pp. 330-428.

Throughout the decade or more after the last moneys were appropriated for the Board, individual congressmen periodically introduced bills to revive the Board in whole or in part, though none got very far despite support from Billings and other sanitarians for some of them. Meanwhile, the vacuum in national public health coverage that was left by the demise of the Board was at least partially filled through the rest of the century by programs or expedients begun in other federal agencies, some of them stimulated by earlier initiatives or trials of the Board. The Marine Hospital Service, of course, benefitted much from Congress's acts by being assigned to take over certain Board activities, notably the quarantine and disease inspection functions but also the weekly health bulletin and other matters. The federal census, taking advantage of its connections with Billings, began a major expansion of its vital statistics operation. In turn, the Department of Agriculture began taking action in several areas of public health concern that the Board, lacking the funds, had explored but not seriously pursued, among them, animal diseases, nutrition and diet, and drug regulation. Not least, the Army Surgeon-General's Office itself remained a prominent public health contributor. And Billings himself, even after retiring from the Army, continued to encourage movements for national health organization well into the twentieth century, when he participated briefly in some of the Committee of One Hundred for National Health's discussions.⁴²

Billings's career, meanwhile, went on almost as if he and his allies had not been roundly outmanoeuvred and decisively beaten in their extended brawl with Hamilton and his congressional supporters for national public health power. To be sure, that struggle kept Billings's relationships with the Marine Hospital Service's leaders antagonistic for years to come. He particularly continued in his conviction that Hamilton had been unprincipled and unfair in his methods, a sentiment that the latter was known to reciprocate in full measure. However, Billings took satisfaction in knowing that most

⁴² Billings played only a limited role in the Committee of 100's work. While named to several of its committees, he had little time to participate in their activities. His main contributions were to evaluate the various proposals for a new national health agency and to lend his name to the Committee's publications and dealings with Congress. There are three folders of his correspondence with Irving Fisher and other material pertaining to the Committee between 1906 and 1911 in the JSB Papers, NYPL. For details of the Census connections, see chapter 7.

of the other Board members had felt as he did. Turner, who was particularly outspoken, became “as mad as the devil” when he had to deal with Hamilton and his “hounds.” And even the reserved Bowditch had joined in the disapproval during the earliest months of the Board: “What apes the opponents of the [Board] are,” he ventured!⁴³

Above all, these men, together with a large proportion of the other leaders of the public health and medical communities, agreed that the Board had been very poorly used by Congress. They also concluded that Billings had run the Board in an outstanding fashion under extremely difficult circumstances. To them, the ending of the Board was in no way a failure on his part, but a gross dereliction by Congress. George Sternberg had assured Billings as early as 1881 that if the latter were to resign it would not be damaging to him or his career in any way, since he had a well “established reputation which in no way depends upon your connection with the Nat.[sic] Board.”⁴⁴ This opinion was borne out in impressive fashion the following spring. At the very moment that the Board was losing favor in Congress, a remarkable collection of America’s most distinguished physicians, scientists, sanitarians, and university heads petitioned President Chester Arthur to elevate Billings to the newly vacant post of Surgeon-General of the Army, though he was ultimately passed over for lack of sufficient seniority.⁴⁵

When Billings ultimately withdrew from the Board, he did so at least partly to prevent Congress’s animus against that body from prejudicing its continued support of the Surgeon-General’s Library.⁴⁶ He thus spent much of his new free time after 1882 working up the plans for the new Library/Museum building and then organizing a campaign within the medical and public health communities to lobby Congress for the necessary building funds. His new official position, beginning in 1883, as overall Director of the combined museum and library operation of the Surgeon-General’s office, did not, perhaps, on the face of it, have much to do with public health. But actually, it provided a means and a focus within the Army Medical Department for Billings, again partly officially and partly in collaboration

⁴³ Turner to JSB, n.d. but ca. July 1881; Bowditch to JSB, 8/11/1879. Both letters are in the JSB Papers, NYPL.

⁴⁴ Sternberg to JSB, 2/23/81, JSB Papers, NLM.

⁴⁵ While this post became vacant four additional times during the next decade, Billings was passed over each time for the same reason.

⁴⁶ Miles, *National Library of Medicine*, pp. 149-150.

with other institutions, to continue and expand some of the laboratory and sanitary experiments, and other pursuits that he had supervised on the Board. It likewise facilitated the expansion of his public health information function within the Surgeon-General's Office. In addition, and far from least, it gave Billings expanded time, facilities, and reason for continuing his professional correspondence. That included not only his American peers but Lister, Edwin Chadwick, Koch, Buchanan, and other prominent European leaders in hygiene and public health, along with the numerous lesser names and comers in these fields who had been users of his Library, his hospitals, and his Board, or had otherwise benefitted from his expertise. It also provided him with a base and with the authority necessary for moving further into the professional organizations, into academia, and also into the public arena in the course of developing and disseminating his concepts of hygiene, sanitation, and public health. But, most of all perhaps, it afforded time and opportunity for Billings to expand his long-term involvements in the field of vital statistics.

Chapter 7

The Transformation of Vital Statistics

Far from least of the concerns of the American Public Health Association in 1872 was the status of America's vital statistics, the ongoing arrangements for recording the nation's births, deaths, and other personal events and for studying their quantitative meanings. This was not surprising, since the more intellectual early members of the Association often already participated in the general interest in quantification and statistics that had been spreading through much of the previous century into many aspects of the country's material life. The medical world itself, in fact, had long since begun to utilize several varieties of statistics: the numerical method and other forms of clinical statistics; the calculations of the actuaries; the quantification of diseases and sanitary measures; political arithmetic and other analyses of demographers and sociologists.

The more avid of America's public health reformers were thus as convinced of the importance of vital statistics collection and study for the long range pursuit of their profession as they were of the desirability of creating a national health bureau. Like the previous generations of American public health professionals, they particularly admired British vital statistics and sought to emulate them. They considered it a truism that collections of vital data were essential for justifying their other activities in public health and assessing their results. They also followed the antebellum generation in looking up to such scholarly statisticians as the British registrar William Farr, to the professionals who, with their systematic analyses of these data, became authoritative guides to the condition of society, government, and health programs.¹

¹ New York's Franklin Tuthill had characterized the statisticians as the "calm, cool heads [who] take the observations, make the calculations, issue the orders,

Shortcomings of Early American Vital Data

Whether compared with the British or some other system, it was painfully obvious that early America's vital statistics had serious problems. A central problem was that the governmental gathering and processing of vital data, when it was done at all, was still strictly a state or local matter, with no federal coordination or other involvement. Where systems did exist, they were often faulty in design and incomplete, their data marred by imperfections. In some states, the very idea of legislating such systems was rejected by taxpayers and lawmakers alike, while some cities continued to draw their vital data from parish registers or bills of mortality from various sources.

Up to 1872, only Massachusetts led by Edward Jarvis and Lemuel Shattuck, Providence under Edwin M. Snow, and a handful of other American states and cities had succeeded in establishing official vital statistics systems that actually functioned at all well, while even those successes were mostly confined to the registration and analysis of deaths.² Birth and marriage registration attempts everywhere were largely ineffective and remained so until the twentieth century. At the same time, the existing registration systems differed in the disease terminologies that the registrars used and in the data that their report forms displayed. As a result, the vital information that was produced in one state or city jurisdiction could not be easily compared with the data of another, while such data collections did little if anything to suggest accurate patterns of life and death for the United States as a whole.

During the 1850s and 60s, the American Medical Association as well as the several National Quarantine and Sanitary Conventions had urged their

and guide our destinies," as "ciphering closet-men" who worked in solitude to separate the age's theories from fact. Franklin Tuthill, "Registration of Births, Deaths, and Marriages," *Transactions of the Medical Society of the State of New York* (Albany: C. Van Benthuysen, 1853), pp. 12-13. See also Cassedy, *American Medicine*, pp. 198-200.

² *Ibid.*, pp. 196-197, 203-206; *Vital Statistics of the United States*, Vol. I (Washington: U. S. Department of Health, Education, and Welfare, 1950), pp. 6-7; Cressy L. Wilbur, "The Outlook for a General System of Registration of Vital Statistics in the United States," *Journal, American Public Health Association*, Vol. XXI (July 1896), p. 237.

members and delegates to work for vital statistics registration legislation and systems similar to the English pattern for their local communities. Originally it was rather innocently agreed or assumed that each state or local jurisdiction could be left to work out its own laws and procedures.³ However, given the disruptions of the Civil War along with a lack of trained local leadership, little or nothing of importance seems to have been accomplished until new professional groups began to organize.

The APHA, proceeding systematically, created a committee on vital statistics registration at its first meeting and agreed on a few basic lines of action. It urged its members to work for registration legislation wherever it was lacking, and it directed the committee to prepare standard forms for the weekly and monthly statistical reports of every community. The meeting also urged the adoption of a common nomenclature and classification of diseases by American institutions, including censuses. Specifically, it recommended the nomenclature developed by the Royal College of Physicians of London and hoped to participate with the College in future revisions.⁴

APHA members agreed that the technical aspects of vital statistics reform could be appropriately left to the hoped-for national sanitary agency and its professional staff. However, committees of the association did get down promptly to the crucial task of stimulating local registration legislation. In fact, they achieved impressive results, with the number of new state registration systems more than doubling by 1880. In addition, the Association's debates over vital statistics matters proved to be important steps toward building a consensus among the members about what needed to be done.

Though not a registrar, John Shaw Billings began participating actively in these debates as soon as he joined the Association. As a young man,

³ Edward Jarvis, "Report on Registration of Births, Marriages, and Deaths," *Transactions, American Medical Association*, Vol. XI (1858), pp. 527, 534-535. Throughout much of the period, William Farr's analyses and publications at England's General Register Office set among the highest standards for the American efforts. For a thorough study, see John M. Eyler, *Victorian Social Medicine: The Ideas and Methods of William Farr* (Baltimore: Johns Hopkins University Press, 1979).

⁴ "Abstract of Minutes, April 18, 1872 to November 12, 1875," *Public Health, Reports and Papers of the American Public Health Association* (New York: Hurd & Houghton, 1876), pp. 537ff.

Billings had absorbed arithmetic and algebra easily and seems to have become mathematically literate before starting medical school.⁵ Later on, when he came to prepare his medical dissertation, he was entirely convinced of the importance of simple statistics in evaluating the various surgical operations used for epilepsy. And, subsequently, through his career in the Army Medical Department, he actively sought the spread of vital and medical statistics in all levels of government as well as among individual physicians and health professionals. Dedicated to better statistics then, as much as he was to the pursuit of science, it became a personal career aim for Billings to keep the faith with his forebears in that field, with the Farris in England and Europe, and with Shattuck and the other pioneers in the United States.

There is no indication that Billings ever harbored thoughts of pursuing a formal career in statistics, mathematics, actuarial science, or some other branch of numeration. At the same time, when he went to APHA meetings, he was as knowledgeable as all but a handful of Americans about those sciences as well as about vital statistical collection, registration, and related processes or skills. And, continuing the learning process over the next two decades or so, he ultimately became the unquestioned prototype of the statistician for late nineteenth century America's vital statistics community.⁶

At his first APHA meetings, Billings solicited donations and exchanges of registration and census reports for the Surgeon-General's Library. And, beyond that, he went out of his way to inform himself, not only about European and British vital statistics practices and systems, but about the problems that had been encountered by the handful of America's pioneering early statisticians who were in attendance. One of the most important of these was Edward Jarvis, who was almost at the end of a long career, one spent both in helping shape Massachusetts' vital statistics and in federal census work. Another individual to learn from was Elisha Harris, who in the decade up to 1876 was active in running both the sanitary administration and the vital statistics system of New York City and who went on in the early 1880s to similar appointments in New York State's new Board of Health.⁷

⁵ Chapman, *Order Out of Chaos*, pp. 30-31.

⁶ James H. Cassedy, *American Medicine and Statistical Thinking, 1800-1860* (Cambridge, Mass.: Harvard University Press, 1984), passim. York: Hurd & Houghton, 1876), pp. 537ff.

⁷ For Jarvis, see Gerald N. Grob, *Edward Jarvis*, passim. For Harris, see E. W. K.[Kopf], "Elisha Harris," *DAB*, Vol. IV, Part 2 (1964), pp. 307-308; and

As a perennial officer and committee member in the association during this period, Harris, through frequent papers and reports, did much to build up a consensus of knowledge among the membership about vital statistics legislation, data collection systems, and other basic matters.

At the same time, Billings sought out some of the newer faces in American public health and vital statistics—such members as John H. Rauch, Henry B. Baker, and others who brought fresh outlooks, ideas, and energies to the Association. However, it was probably another veteran, Snow, to whom Billings turned the most often, both in the APHA and elsewhere during the decade or so after 1872, for technical illumination and advice pertaining to vital statistics. Since 1856 Snow had been Registrar of Vital Statistics as well as Superintendent of Health in Providence. Moreover, his 1860 “Report on Registration” was still a standard guide to the subject for America’s local officials and sanitarians. For his part, Snow found in Billings a no-nonsense kindred spirit who already understood the needs and values of vital statistics, if not yet all of its processes. By 1878 he was expressing to the latter his “earnest desire to do anything” within reason to advance the younger man’s ideas for the development of that field.⁸

The National Board and a Conference of Registrars

As it turned out, during the hectic months of pushing the National Board of Health through, Billings had no time to take immediate advantage of Snow’s offer, or of the skills of others in the vital statistics community. Moreover, when he did find time, given the lack of an administrative staff and office facilities, he had to improvise drastically in order to take on any vital statistics programs. This meant getting extra volunteer services from willing fellow Board members and outsiders as well as doing far more himself than he should have had to. But at least Congress had not actually banned such

John Duffy, *The Sanitarians: A History of American Public Health* (Urbana: University of Illinois Press, 1990), pp. 118-121, 130-131, 148.

⁸ Edwin M. Snow to JSB, 10/17/78, JSB Papers, NYPL. For Snow, see Seebert J. Goldowsky, “Edwin Miller Snow,” *ANB*, 20 (1999), pp. 340-341; and James H. Cassedy, “Edwin Miller Snow: An Important American Public Health Pioneer,” *Bull. Hist. Med.*, XXXV, no. 2 (1961), pp. 156-162.

activities; it covered them by authorizing the collection and dissemination of public health information.⁹

Despite such difficulties, the Board at its organizational meeting made the matter of vital statistics one of its leading concerns and created a standing committee of three to deal with it. Stephen Smith of New York was chosen to be the committee's first chairman, with Robert Mitchell of Tennessee and Hosmer Johnson of Illinois as members. Billings, as Vice President, from the start also began the habit of attending the committee's meetings and participating fully in its deliberations and decision-making, mainly because Smith was not able to attend all of the meetings. After the first year he succeeded Smith as chairman. Meanwhile, at one of the earliest meetings, the committee assigned priorities to their list of vital statistics matters needing attention, a list that elaborated upon the APHA's list and which included a specific proposal for the "eventual establishment within the Board of a national center, or 'Bureau of Vital Statistics.'"¹⁰

In another early action, the committee took over from the Marine Hospital Service the responsibility for publishing weekly public health reports. Begun in June 1879 and edited by Turner, the Board's *Bulletin* went on to publish general public health news as well as to encourage and assist the spread of vital statistics laws and systems in the states and cities. It particularly featured regular summaries of mortality statistics, sometimes in tabular form and usually arranged by diseases and other causes of death. As in the Marine Hospital Service's earlier publication, these data included abstracts of sanitary and mortality statistical reports for selected European and British cities that by law had been compiled by American consular officials abroad. To obtain comparable information for the United States, the committee sought the cooperation of America's local health officers, registrars, physicians, and others. In particular, in cities where regular registration systems or bills of mortality arrangements were in existence, the officials were cajoled into supplying regular weekly or other mortality reports for the *Bulletin*. From the beginning, and as long as the Board had the funds to publish it, this organ was a welcome and regular source of health information, particularly quantitative, across the United States as well as abroad. A Scottish correspondent wrote his opinion about it to Billings,

⁹ Wyndham D. Miles, "A History of the National Board of Health, 1879-1893," 2 vols., MS, National Library of Medicine, pp. 477-486.

¹⁰ *Ibid.*, p. 474.

"Nothing so comprehensive and so thorough in administrative details has . . . emanated from any other government."¹¹

From this period on, Billings carried on a correspondence with local American health officials, not just to get better data from them for the *Bulletin* but to stimulate the creation and improvement of local registration systems. To drive his message home, he drew upon a fertile supply of analogies and metaphors. Writing, for instance, to C. N. Brackett of the New Jersey State Board of Health, he explained that "Without [vital] statistics, collected and properly classified by some central state authority, a state is like a merchant doing business without keeping any account of stock." Similarly, in an address to a State Sanitary Conference in Maryland, he suggested that such registration "is, as it were, the eyes of the State Board of Health, and without it the Board is like a blind man trying to put out a prairie fire."¹²

Even as he lectured others, Billings realized that, since neither he nor the other Board members were registrars or statistical specialists, they had to look to qualified outsiders for technical advice as well as for ideas about what other vital statistics programs the Board should undertake. From the outset, he personally counted on Snow and Harris for substantial help. He thought that Snow could be of special value in helping organize and run the *Bulletin*, but the latter had to beg off from that or any major vital statistics role with the Board since he could only rarely get away from his routine Providence duties. Snow did continue responding to Billings's letters promptly and helpfully as well as performing occasional smaller jobs for the committee.¹³

Harris, in turn, undertook various contract work for the Board during the late 'seventies. Initially, he left the impression with Billings that he was

¹¹ William T. Gairdner to JSB, 1/14/1880, JSB Papers, NLM; see also Miles, *National Board of Health*, pp. 479-481. However, in England, William Farr for years had issued a weekly publication that had some similarities, though he focussed more on the data itself. It was a summary of some of the vital statistics that were to be included in the annual reports of the Registrar General.

¹² JSB to C[yrus] F. Brackett, 2/23/88, JSB papers, NLM, box II; JSB, "Why a State Should Have a Proper System of Vital Statistics," *Seventh Biennial Report of the State Board of Health of Maryland* (Annapolis: James Young, 1888), p. 515.

¹³ Edwin M. Snow to JSB, 7/7/1879; 9/18/1879; 12/10/1879; 12/29/1879, all in JSB Papers, NYPL.

ready and willing to assist significantly with vital statistics matters, such as helping the committee sort out its options and preparing detailed plans. Early in May 1879, seemingly acting on his own initiative, Harris proposed to Snow that the two of them meet informally with Henry Baker to devise a comprehensive vital statistics scheme for the Board. Snow, however, considering such a meeting premature, persuaded Harris and Billings to defer it until such time as the Board would have "more definite objects in view."¹⁴

Two months later, still uneasy, Snow advised Billings that Harris had increasingly "large plans" in mind, and the Providence man wondered where they fitted in the Board's thinking. Answering immediately, Billings replied that, in fact, they did not fit. In fact, Harris had recently been "entirely relieved from all duty connected with the subject of vital statistics" and had been summarily transferred to new duties as one of the Board's quarantine inspectors along the Atlantic coast. The reason proved to be that Billings had found the latter's suggestions to be "too vague and general to be of any practical use, at least to me. I must say that I failed to get any definite information from him as to what was or what was not the best course to pursue in any particular case."¹⁵

Following Harris's departure, Billings and the vital statistics committee recognized that they needed still more outside guidance. They particularly required help with some of the basics, on the problem of effectively ordering their priorities as a public agency, but also in working out how they could "secure greater uniformity in the methods of obtaining, recording, and publishing vital statistics." The committee finally decided to bring as many as possible of the Americans who were working closely with vital statistics to a Washington gathering in the new year.¹⁶ The event was to become the first national conference devoted to problems of registration and vital statistics. A cautious Snow reminded Billings that "a convention is no good place to settle on a plan" unless things were carefully thought through ahead of time.¹⁷ But, as things worked out, he needn't have worried.

The Conference on Vital Statistics took place in Washington on May 6th and 7th, 1880, in connection with the regularly scheduled spring meeting of

¹⁴ Snow to JSB, 5/2/1879, JSB Papers, NYPL.

¹⁵ JSB to Snow, 7/9/1879, JSB Papers, NLM.

¹⁶ JSB, "The Registration of Vital Statistics in the United States," *National Board of Health Bulletin*, Vol. 3, no. 33 (Feb. 11, 1882), p. 296.

¹⁷ Snow to JSB, 12/29/1879, JSB Papers, NYPL.

the National Board. Cabell, as Board President, presided over the event, while Turner, Stephen Smith, Billings, and the other members of the committee on vital statistics handled the local arrangements.

The bulk of the twenty-five outside participants came, of course, from America's northeast, partly reflecting the reality that those persons could best afford the travel costs, but also because many of the functioning vital statistics registration systems were in that region. Two participants came from the upper South, while others were from Chicago, Pensacola, and New Orleans. Twenty-three of the twenty-five were physicians.

All who came seemed to consider the conference as a unique learning experience, and almost all brought problems or questions from their own professional experiences for discussion with the group. By far the most numerous among the participants were the health officers, men who had had at least some experience in the supervision of registration systems and personnel and who recognized the scientific importance of accurate vital data in public health administration. Of the six who represented state boards of health, Illinois' John Rauch and New Jersey's Ezra M. Hunt played particularly active roles in the proceedings, while Edward G. Janeway of New York, R. A. Cleemann of Philadelphia, and Samuel H. Durgin of Boston were similarly productive discussants among the dozen or so municipal health officers.¹⁸

Of the outside participants, only Harris and Snow had status at that time as recognized experts in vital statistics work. Despite his differences with Billings, Harris brought valued experience, perspective, and continuity to the deliberations. However, it was generally agreed that it was Snow who spoke to the conference both with the greater technical authority and with a keen sense of the politically possible. Billings, in fact, midway in the conference, reminded the participants that Snow, in his landmark "Report on Registration" of 1860, had long since laid out with specificity and clarity many of the matters that the conference was now puzzling over. Rejecting the conventional practice of invoking the Englishman William Farr as the exemplar of vital statistics expertise, he implied that this American conference might well look to the home-grown Providence registrar, with his practical wisdom, as its authoritative model.¹⁹

¹⁸ "Proceedings of Conference on Vital Statistics," *NBH Bull.*, Vol. 2 (1881), Suppl. 5, pp. 1-14.

¹⁹ *Ibid.*, p. 9.

The agenda for the meeting was the result of much preliminary debate in the Board's committee on vital statistics. While it was presented as a collective product, it was more accurately a strong reflection of Billings's desires for a limited program aimed at getting "some very simple general principles established." He had personally rejected several proposals because they were too general, and ultimately managed to narrow the program to four fairly specific tasks or areas for discussion.²⁰ Of these, the group's evaluation of the various modes of data collection and registration gave them little difficulty; their consideration of statistical reporting techniques revealed little agreement and had to be referred to the National Board for further examination;²¹ the discussion of desirable makeups of certificates of death, birth, and marriage also originally brought deep differences of opinion, but after postponing any decision about birth and marriage certificates the meeting easily adopted a model death certificate;²² and finally, the meeting endorsed and adopted the Royal College of Physicians' nomenclature of causes of death with no opposition, along with proposals for American collaboration in the work's subsequent revisions.²³

²⁰ JSB to Elisha Harris, May 1880, JSB Papers, NLM, Box 11. See also Miles, "National Board of Health," pp. 481-483; and "Proceedings of Conference on Vital Statistics," *loc. cit.*, pp. 1-14.

²¹ This and other uncompleted conference matters were dealt with over the next few months by one of the conference's committees. JSB, et. al., "Report of Committee on the Nomenclature of Diseases and on Vital Statistics," *Annual Report of the National Board of Health, 1880* (Washington: GPO, 1881), Appendix O, pp. 537-540; and "Proceedings of Conference on Vital Statistics," *loc. cit.*, p. 12.

²² *Ibid.*, pp. 2-14.

²³ Some months later, Harris, aggrieved at not having been included on the committee to deal with the College, and assuming that Billings had chosen the members himself, wrote an accusatory letter that the other man, though claiming himself to have been blameless, had considerable difficulty in answering. JSB to Harris, 11/22/1880, JSB Papers, NLM. See also JSB et. al., "Report on Nomenclature," *loc. cit.*, pp. 537-540; "Proceedings of Conference on Vital Statistics," *loc. cit.*, pp. 1-3, and *passim*; Royal College of Physicians of London, *The Nomenclature of Diseases* . . . , 2d. ed. (London: RCPL, 1884), pp. xvi, xxiii; A. H. T. Robb-Smith, "A History of the College's Nomenclature of Diseases: its Reception," *J. Royal Coll. Phys. London*, Vol. 4, no. 1 (Oct. 1969), pp. 5-15.

If the Conference on Vital Statistics accomplished most of what Billings had hoped for, it was because he had involved himself fully in every aspect of the affair. He cajoled the other leading lights of the profession to attend, and he got most of them to participate. He acted as floor manager of the sessions for the Board: introducing and interpreting the respective agenda items, keeping the discussion on track, responding to questions, formulating many of the motions, and keeping the other participants involved. And he took a central role in every phase of the substantive discussions, dealing with the legislative and administrative ramifications of the topics as well as the scientific.²⁴

Following the conference, Billings did not undertake any new major projects with his Committee on Registration and Vital Statistics, largely because of the increasing uncertainty surrounding the Board's funding and future prospects. However, he did carry out a good deal of follow-up activity aimed at maintaining the momentum that the conference had generated.

He considered it particularly important to spread word about the imminent publication of the revised disease nomenclature in London and to emphasize its importance for American public health and medical personnel and their institutions. When the British Registrar General's office in 1882 announced that it was adopting the new version, Billings made sure that the U.S. Army Medical Department followed suit. He also urged Harris and other registrars and health officers to do the same and to resist all thoughts of preparing their own local nomenclatures. "The importance of uniformity is so great," he emphasized to Harris, "that it should overcome all minor objections.—By all means do not change the order of the diseases in your published list. If you do, everything will be in confusion in this country for another ten years—your tables will not be comparable with the English nor with those of other States.—I discussed this matter fully with Dr. Woodward and the Surgeon General, and we all agreed that while we do not fully approve all the details of the new lists of the College and Registrar General, yet it was our duty to accept them for the present."²⁵

²⁴ I draw these conclusions from my examination of the official report of the meetings. "Proceedings of Conference on Vital Statistics," *loc. cit.*, pp. 1-22. See also Miles, *National Board of Health*, p. 484.

²⁵ JSB to Harris, 10/9/1883, JSB Papers, NLM. Following the demise of the National Board of Health, the American push for a uniform disease nomenclature lagged until around 1900, when the APHA introduced the Bertillon system into this country. For discussion, see James H. Cassedy,

In the middle of these discussions, the National Board of Health lost the capacity to play further major roles in American vital statistics reform as well as in public health generally. In June 1882, faced with the steady diminution of congressional funding, the Board was forced to discontinue its much-valued *Bulletin*, while in August Billings resigned, taking with him several other Board members. As he left the Board, he perceived that the achievement of an effective national vital statistics registration system remained one of the country's most urgent public health needs.²⁶ He already had a firm idea of what steps were required to bring this about. And he enthusiastically recommended the United States Census as a highly suitable and probably receptive agency to carry on this work since he was assured of being invited to play a large role in it.²⁷

The Census and the Federalizing of Vital Statistics

Billings's 1882 mention of the Census as a possible substitute seat for national vital statistics reform projects and energies was by no means a new or passing thought. It was a fully considered possibility or option that had been taking shape in his mind through the previous decade while he served that agency as a consultant. To be sure, the federal Census was a government operation that had almost as many uncertainties as the National Board of Health. But at that point in time, it constituted the most logical place in the government for the continuation and extension of the Board's

Charles V. Chapin and the Public Health Movement (Cambridge, Mass.: Harvard University Press, 1962), pp. 143-145. See also Royal College of Physicians, *The Nomenclature of Diseases* . . . 2d. Ed. (London: The College, 1884)

²⁶ The breadth of this consensual support was spelled out in much detail in an official APHA document of late 1881, following the Board's conference on Registration. "Report of the Committee on Vital Statistics and a Uniform System of Registration," *Public Health Reports and Papers*, VIII (1882), pp. 339-342.

²⁷ The quotation is from a much abbreviated version of the report, JSB, "Registration of Vital Statistics in the United States," *loc. cit.*, pp. 295-296. The full report is JSB, "The Registration of Vital Statistics," *Annual Report of the National Board of Health, 1882*, Appendix E (Washington: GPO, 1883), pp. 355-461. A third version is JSB, "The Registration of Vital Statistics," *Amer. J. Med. Scis*, n.s., Vol. 85 (1883), pp. 33-39.

vital statistics activities. Moreover, census work already constituted a large and highly congenial area of personal career activity for him even though part-time, one that was intellectual in nature as much as administrative and eventually technical.

The United States census had figured in sanitarians' plans for obtaining vital statistics well before the establishment of the National Board of Health or even of the American Public Health Association. At least as far back as the 1840s, Edward Jarvis and other reformers had suggested using the census mechanisms as an alternative to waiting for state registration systems to supply death data. And in 1850 new federal legislation provided for such data to be obtained through regular census enumerations. When carried out, however, the mortality enumerations of the censuses of 1850 and 1860 proved discouragingly inadequate, with little more than sixty percent completeness in either of them.²⁸ Moreover, in 1870, in the absence of new legislation, there could be little realistic hope for much improvement in the data that was expected to be obtained from the ninth census.

Billings became personally aware of the scope and nature of these continuing deficiencies soon after the enumerations were made in 1870. Early that year, Francis A. Walker, recently chosen Superintendent of the Ninth Census, requested Surgeon-General Barnes to direct the correction of the statistics of mortality that were produced by that operation. Committing his office to the task, Barnes in turn first designated Woodward to carry it out and then added Billings to the project when its magnitude became apparent.

Laboring at the task between 1870 and 1872, the latter two of course could not do anything about the large continuing incompleteness of the mortality count. However, they did advise Walker on several substantive matters. For one, they urged adoption of the Royal College of Physicians'

²⁸ Grob, *Edward Jarvis*, pp. 137-154, 185-200. For the general history of American censuses, see Margo J. Anderson, *The American Census: A Social History* (New Haven: Yale University Press, 1988); and Carroll D. Wright, *The History and Growth of the United States Census* (Washington: G.P.O., 1900 and reprinted by Johnson Reprint Corp, 1966). Wright briefly summarizes the legislative and organizational history of each of the large general areas of inquiry, including that of mortality, as they became incorporated in the census operation. Anderson, however, has deliberately focused her study on the population segment of the censuses and mentions the other areas, including that of mortality, only in passing.

disease nomenclature and classification.²⁹ They also collaborated in Walker's plans to include maps in the various census publications; specifically, they identified and arranged data on disease distribution that went into four maps.³⁰ For the most part, however, in an experience similar to that of Edward Jarvis, their labors turned out to be the tedious repairing of the most conspicuous discrepancies, contradictions and errors that they found in the enumerations.³¹

While those modifications did little if anything to improve the 1870 mortality report, Walker attempted to put a good face on the results for public consumption, maintaining that the report provided as much information about the nation's mortality experience as most people would want. However, when he spoke about it to the APHA in 1873, he readily conceded, as others already had, that the 1870 census, like its two predecessors, had been structurally unable to produce mortality statistics that were at all reliable or adequate. The sanitarians who heard him concurred with his conclusion that new legislation and administrative procedures were clearly needed in coming years to bring about any improvement. Modifications were also necessary to make possible such socially and politically interesting comparisons as that of the mortality of the various racial segments of the American population.³²

²⁹ An important aspect of that work had been its modernizing of the long-standard disease classification of William Farr. Reflecting the views of Woodward and Billings, Walker commended the new classification's compilers for having replaced such disease designations as "Zymotici, Miasmatici, [and] Diathetici", along with other "offensive" terms that had "burdened" Farr's work. See Woodward's report and Walker's comments in *The Vital Statistics of the United States*, Volume II of *Ninth Census of the United States, 1870* (Washington: G.P.O., 1872), pp. v-vi.

³⁰ The maps, which appeared in Volume II of *Ninth Census, 1870*, depicted the distribution and prevalence of four groups of diseases: consumption; malarial diseases; enteric, cerebrospinal, and typhoid fevers; and intestinal diseases. For a valuable study of the cartographic background of this census, see Fulmer Mood, "The Rise of Official Statistical Cartography in Austria, Prussia, and the United States, 1855-1872," *Agricultural History*, Vol. 20 (1946), pp. 218-222.

³¹ For some idea of the herculean manual labors involved, see Grob, *Edward Jarvis*, pp. 141-150, 185-194.

³² Francis A. Walker, "The Relations of Race and Nationality to Mortality in the United States," *Public Health Reports and Papers*, Vol. I (1873), pp. 18-35.

It was obvious to many in the 1870s that the federal census's problems with death enumeration needed as much attention as did the state and city problems with death registration. In fact, the search for solutions led to a continuing if sporadic dialog between Billings and Walker throughout the rest of the decade and beyond.³³ Both men kept the matter under discussion at the APHA and worked out some accommodations concerning it between that organization, the Medical Department, and the Census. Walker, in 1875, apparently with some hope of keeping the other man's interest in censuses active from one census to the next, sent Billings a copy of his newly issued *Statistical Atlas of the United States*.³⁴ This gesture was probably not necessary, for Billings not only was already highly challenged by the census problems but welcomed his dialog with a man of Walker's caliber. At an early point in their relationship he had come to appreciate the charismatic Walker not only as an "agreeable" professional associate but as a man of wide knowledge and a real gentleman. Moreover, he found him to be "a born leader—bold, frank, sincere, and entirely devoted to his work." He identified closely with Walker's innovative and action-oriented approach, with his utilization of non-political experts and administrators, and with his search for technical improvements in census methods.³⁵ And he found the

Probably on Billings's and Woodward's suggestion, Walker also obtained a corroborative opinion from the actuary, Ezekiel B. Elliott. See the latter's "Remarks Upon the Statistics of Mortality," *The Vital Statistics of the United States; Ninth Census of the United States, 1870*, Vol. 2 (Washington, D.C.: G.P.O., 1872), pp. ix-xvi.

³³ Between his appointments with the Census of 1870 and that of 1880, Walker held other positions both in the government and outside, but to maintain some continuity of census organization and planning, the Secretary of Interior named him to a non-salaried census post during this period. See discussion in Wright, *History of the Census*, pp. 56-57. A far more extended and analytical commentary on Walker's census career and contribution, is Anderson, *American Census*, pp. 78-106.

³⁴ Walker to JSB, 3/25/1875, JSB papers, NLM, Box 7.

³⁵ JSB, "Biographical Memoir of Francis Amasa Walker 1840-1897," in National Academy of Sciences, *Biographical Memoirs*, Vol. V (Washington: The Academy, 1905), pp. 209-218. For a more recent short summary of Walker's life, see A. W. Coats and Patrick Williams, "Francis Amasa Walker," *American National Biography*, Vol. 22 (1999), pp. 491-493. See also Bernard Newton, *The*

latter helpful in his suggestions for the APHA's sanitary survey and other public health activities.³⁶

When Walker, in the late 1870s under his new appointment as Superintendent, began full-time planning for the Census of 1880, he seems to have already selected Billings both to design the data collection portion of the mortality operation and to take charge of its later phases.³⁷ He obviously valued the fact that the latter, on his own, had continued studying the problem of how to improve the census death statistics. Billings now made it clear to Walker that there were still no easy solutions, but he felt that the recent close collaboration between the APHA, the National Board, and the census officials, if continued, would facilitate progress in that direction. Most important, he was ready with two proposals for supplementing or replacing certain of the vital statistics normally obtained through enumeration. Walker agreed to both provided Billings would organize them.

One expedient was to enlist physicians in the reporting process. To prepare for this, Billings had the National Board of Health review the suitability of the death return forms that were to be used in the census. He also made it known, through the *NBH Bulletin* and other professional periodicals, that the Census office would supply copies of the forms to interested physicians.³⁸ Above all, he used his concurrent positions as an officer of the American Medical Association and also of the APHA to urge the participation of physicians in this urgent public health fact-finding effort.³⁹

The other supplement to the enumeration, even more promising, was the experimental use of the death records that were being collected by existing state and municipal vital statistics registration systems. Most of those systems were managed by knowledgeable health officers and

Economics of Francis Amasa Walker: American Economics in Transition (New York: Augustus M. Kelly, 1967).

³⁶ For discussion, see Chapter 6, *passim*.

³⁷ I have found no official papers pertaining to this appointment, but there is no reason to doubt that Barnes concurred in the arrangement, as he had in 1870.

³⁸ Miles, *National Board of Health*, p. 484.

³⁹ JSB, "Address in State Medicine and Public Hygiene," *Trans. of AMA*, Vol. 30 (1879), pp. 279-291; JSB, "The President's Address," *Public Health Papers and Reports*, Vol. VI (1880), pp. 7-8, 456.

registrars who had attended the Conference on Registration. However, new systems and new registrars were steadily appearing, providing tangible testimony to the 1870s efforts of the APHA. As the various systems became operational, sample death records were supplied to the *NBH Bulletin* and other professional organs or bodies where they began to demonstrate how a close state and federal statistical collaboration could be made to work out. In addition, such groups began the process of evaluating the completeness and quality of the mortality data gathered by those systems. And, by 1880, from what evidence they already had, Billings and his supporters were confident that, when tried with the new census, the data from the registration systems would already demonstrate their immense superiority over the crude data of the enumerators and would emerge as benchmarks of excellence for the future.

Billings also hoped that the Census of 1880 could take a first step toward realizing a long-held dream of sanitarians, that of obtaining records of the data of disease. And he made strenuous efforts in that direction. In 1878 he drew up a plan for sickness enumeration that he discussed at length with Walker, Barnes, several congressmen, and a number of public health colleagues. The responses seem to have been overwhelmingly favorable. However, Edwin Snow, despite agreeing with the proposal in principle, kept finding problems: i.e., the plan included too many questions; the questions were too complicated; they would be of little use statistically; and the introduction of the plan at that particular time seemed premature. Snow's extended arguments finally proved persuasive with Billings, who eliminated most of his original slate of questions. That left only a single question about sickness for inclusion in the final schedule.⁴⁰

⁴⁰ JSB to Surgeon-General Barnes, 9/28/1878, in JSB, *Collected Papers*, II, 1871-1882, NLM. For a review of related 19th century British public health statistical problems, see Graham Mooney, "Professionalization in Public Health and the Measurement of Sanitary Progress in Nineteenth-Century England and Wales," *Soc. Hist. of Med.*, Vol. 10 (1997), pp. 53-78. See also Edwin M. Snow, "Report on Registration," *Proceedings and Debates of the Fourth National Quarantine and Sanitary Convention* (Boston: Rand & Avery, 1860), reprint, pp. 17-18; JSB, "Remarks on Medical Topography," in "Report of the Committee on the Plan for a Systematic Sanitary Survey of the United States," *Public Health Papers & Reports*, II (1874 and 1875), pp. 50-52. JSB to Barnes, 9/28/1878, loc. cit. Barnes to Hon. S. S. Cox, 10/15/1878, attached

Sometime prior to the actual taking of the tenth census, in June 1880, Walker obtained Billings's agreement to remain as head of its vital statistics operation up to its conclusion. Accordingly, although Walker resigned at the end of 1881 to become President of the Massachusetts Institute of Technology, Billings continued for another three years and more with a large measure of autonomy, working at the tasks of organizing the mortality data that had been collected and preparing them for publication. In so doing he gained the admiration of James H. Wardell, Walker's successor as Superintendent, who was responsible for overseeing the final processing of the Census as a whole. Wardell was impressed with how much Billings had accomplished for the Census during those years, somehow squeezed in among his non-census activities: "He has projected the entire scheme of compilation for the Mortuary Statistics of the Census, has supervised the work in all stages of its progress, and has subjected the results of these vast tabulations to a discriminating analysis and discussion."⁴¹

The three-volume report on the vital statistics of the 1880 census came out in 1885 and 1886. In this document and elsewhere, Billings reported mixed success for his various census innovations and experiments. He expressed satisfaction that several of these features, specifically his division's selection of mortality tables and its use of the Royal College's revised nomenclature of diseases, would be widely emulated in state censuses and health department reports. On the other hand, he had to report that "the results of the attempt to record the number sick on the day of the census [were] not very satisfactory."⁴²

Billings went on to explain that mortality data collection under the 1880 census regrettably still had had to be conducted under a crippling legislative mandate. The federal enumeration had had to be employed again since it was still the only means of obtaining any idea, however rough, of deaths and death

to Ibid. JSB to Snow, 9/7/1878, JSB papers, NLM; Snow to JSB, 10/17/1878, 4/25/1879, and 5/14/1879, all in JSB papers, NYPL. See also C. D. Wright, *History of the Census*, pp. 62-63, 167, 167.

⁴¹ James H. Wardle, quoted in JSB, *Report on the Mortality and Vital Statistics of the United States*, Vols. XI and XII of U. S. Census Office, *Tenth Census of the United States, 1880* (Washington: GPO, 1885, 1886), Vol. XI, p. 3.

⁴² *Ibid.*, Vol. XI, p. xxvii; and JSB, "Mortality Statistics of the Tenth Census," [Abstract], *Bulletin of the Philosophical Society of Washington*, Vol. 4 (1880-1881), pp. 164-165.

rates for by far the largest portion of the United States. Moreover, as foreseen, it had proved as impossible to compile accurate vital statistics by that method as it had been in the three preceding censuses, and the completeness was still less than 70%. To be sure, a certain amount of supplementary data was obtained from cooperating physicians. But Billings ended up being less than enthusiastic about the quality of these data. A considerable number of responses, it turned out, were not from "competent medical men, but from all those who chose to call themselves physicians."⁴³

By contrast, Billings's experiment with using death registration records as a second type of supplemental data was a conspicuous success. It was a positive step, one that introduced a welcome element of quality and reliability into the enterprise. Under this arrangement, data were obtained from all local jurisdictions with registration systems producing death statistics that were at once acceptably accurate and complete; ninety percent became the standard. Billings identified twenty-two jurisdictions that met or approached this standard in 1880—two states, nineteen cities, and the District of Columbia—and denominated them collectively the death "registration area." As he had insisted, this cooperative state-city-federal enterprise had been scrupulously conducted on business principles; the various contributing localities were all paid appropriately for the use of their data.⁴⁴

Rapidly recognized as a benchmark of excellence in vital statistics, the concept of the death registration area was continued in subsequent federal censuses. Billings naturally adopted it to bolster the mortality figures of the 1890 enumeration. By then six additional states had become eligible for inclusion in the death registration area, while in 1900 three further states gained admission. In 1903, the newly created permanent Census Bureau totally abandoned enumeration as a means of collecting death statistics and began efforts to establish a birth registration area. From then on, the Bureau staff relied completely on its cooperative arrangements with state and urban registration offices to ensure regular supplies of reliable data. At

⁴³ JSB, *Vital Statistics of Tenth Census*, Vol. XI, p. xi.

⁴⁴ The political entities included in the original death registration area were Massachusetts, New Jersey, the District of Columbia, Baltimore, Brooklyn, Charleston (S.C.), Chicago, Cincinnati, Cleveland, Indianapolis, Louisville, Milwaukee, Nashville, New Orleans, New York, Philadelphia, Pittsburgh, Providence, Richmond, San Francisco, St. Louis, and Wilmington. See *Ibid.*, *passim*.

that same time, the Bureau expanded the criteria for future admissions to the area by requiring states to enact acceptable registration laws and to use standard death certificates.⁴⁵

Technological Revolution in the Census: Tabulating Mortality Data

As the outside expert brought in on an ad hoc basis to head the tenth census's mortality operation, Billings was essentially insulated from the political headaches that constantly beset Walker as well as from many of the financial and other administrative problems. Left largely to focus on and manage the intellectual and technological elements pertinent to the gathering, processing, and analysis of mortality data, for instance, he was not called on to join other census statisticians in working out new formulas for legislative apportionment. Moreover, for obvious reasons, his compilations of mortality figures were rarely sought after by Gilded Age publicists seeking data to illustrate the American nation's spectacular growth. At the same time, Billings was as knowledgeable as almost any of his census associates about the general ramifications of that growth, including its profound implications for the census enterprise itself. In fact, with his ongoing studies of the relentless pressures of the growing population alone, he was well prepared to predict and plan for the continuing expansion, not only of the Vital Statistics Division, but of other segments of the census enterprise. He was able, for instance, to anticipate the likely magnitudes in the multiplication of clerks and specialists in the Washington office; the proliferation of subject schedules and inquiries; the increase in the number and size of publications; the needs for improved methods and apparatus.

Quite apart from these problems and pressures of growth, the ephemeral nature of each successive census made for a cyclical operation typified by

⁴⁵ Admission dates of states to the death registration area up to the middle of the twentieth century may be found in "History and Organization of the Vital Statistics System," *Vital Statistics of the United States*, Vol. I (Washington: National Office of Vital Statistics, 1950), pp. 12-13. For the larger significance of this development, i.e. the historical progress of registration as a measure of state and national civilization, see James H. Cassedy, "The Registration Area and American Vital Statistics: Development of a Health Research Resource, 1885-1915," *Bull. Hist. Med.*, 39, No. 3 (1965), pp. 221-231.

much hectic activity and uncertainty if not actual crisis. This atmosphere could be noticed at the beginning of each decennial effort, and it was intensified throughout by the fits and starts of congressional debate on the scope of the census, by chronic inadequacies in budgeting, by the requirements of rigid timetables, by the demands of assembling a large and diverse workforce almost from scratch in a very short time span and then dismissing much of it abruptly following completion of its spasmodic labors. The reengagement of Billings and other experienced experts from one census operation to the next was certainly desirable as a means of minimizing the confusion.

Speaking further about the difficulties of the 1870s and 80s, as Anderson has written, "those familiar with the internal workings of the Census Office . . . knew that the real crisis facing the Census Office [lay in the process of] tallying or cross-tabulating the population data." Beginning chiefly in the Walker period, demands spread in all sections of the census operation for the technical staffs to produce and tally increasingly detailed breakdowns of the basic data and otherwise to expand their statistical analyses and presentations. These operations made the processing of the material increasingly unwieldy. The situation was also exacerbated by the continued carrying out of the tabulating and some other operations by hand, thus perpetuating a frustrating bottleneck that produced ever growing delays in completing the various segments of the census.⁴⁶ During this period, several census officials introduced mechanical devices in the hope of relieving these difficulties, but none proved more than minimally successful.⁴⁷ On the contrary, the deeper that Billings got into census operations, the more urgent, he saw, was the need for more effective solutions to such operational and technical problems, not only in the mortality work but in all of the other census segments, particularly in the population segment.

When the two enormous tomes of the tenth census's vital statistics report were ready for the printer in 1885, each one over 1,000 pages, Billings paused to insert two acknowledgments in his introduction. He especially noted the essential contribution of his principal statistician, William A. King, who had supervised the central processing labors, the complex and time-consuming

⁴⁶ For a general history of the census after 1860, see Anderson, *American Census*; the quotation is on p. 102. See also Wright, *History of Census*, pp. 52-69.

⁴⁷ Leon Truesdell, *The Development of Punch Card Tabulation in the Bureau of the Census 1890-1940* (Washington: Bureau of the Census, 1965), pp. 1-25.

work of compiling and translating the rough mortality data into tabular or other formats desired by Billings.

In addition to his mention of King, Billings also acknowledged the assistance of Herman Hollerith, a recent engineering graduate of Columbia College's School of Mines. At intervals between 1879 and 1882, though he was employed in another division of the census, the precocious and already inventive Hollerith seems to have sought diversion by doing odd jobs in Billings's division. His contribution there was originally to help with the compiling of life tables according to the formulae and methods of William Farr and preparing diagrams to illustrate them. Billings, delighted to have an additional mathematically competent individual available, had Hollerith prepare life tables for certain of the individual states, but deferred any attempt at creating a national life table until more accurate and complete data became available.⁴⁸

The two men did not enter into any kind of formal mentor-student relationship; Billings at first simply showed Hollerith around the vital statistics division and explained what the latter was expected to do. However, those contacts quickly lead to an extended series of informal brainstorming sessions between two mentally agile and probing individuals with differing intellectual backgrounds. This mainly took the form of impromptu discussions between the two that focussed on the current census problems, sessions that typically sprang up as they walked around the large and often noisy census processing rooms and were sometimes continued during or after dinner at the Billings home. At some point in time and place that neither participant ever precisely identified, Billings the census administrator stated very directly to Hollerith the young engineer his perception of the census's desperate need for some kind of mechanical apparatus that could perform the routine tabulating of the basic population data, perhaps "something on the principle of the Jacquard loom, whereby holes in a card regulate the pattern to be woven."⁴⁹

⁴⁸ JSB, *Vital Statistics of Tenth Census (1880)*, Vol. 11, p. ix; *Ibid.*, Vol. 12, p. cxlii; and JSB, "Mortality Statistics of the Tenth Census," *Bull. Philos. Soc. Wash.*, Vol. 4 (1880-1881), p. 165.

⁴⁹ Quoted in Truesdell, *Punch Card Tabulation*, pp. 30-31. Truesdell reviews recollections of Billings, Hollerith, and other individuals apropos these matters, *Ibid.*, pp. 30-33.

Hollerith evidently took this statement much as Billings had intended, not quite as an invitation or request but rather as a personal challenge and opportunity. Reflecting on it in that sense over the next several months, he continued his brainstorming with Billings, spent time in the population division to make himself familiar with the tabulating operation, and generally studied the problem from every side. Ultimately, probably by mid or late 1880, he informed Billings not only that he thought he could build a machine to do the job but that he had decided to form a company to develop and sell the machines commercially. At this same time Hollerith asked Billings to join him in the enterprise, but the latter declined, expressing no interest in that aspect of the venture.⁵⁰

From that point on, Hollerith's career as inventor, designer, and industrial entrepreneur took off. While using some of his time to work on other promising investigations and ventures, he nonetheless committed himself more and more deeply through the decade of the 80s to the project for the census. Refining and testing his ideas first on crude models, he changed his approach several times as he went along. However, by 1884 he had settled on a tabulation system that had grown out of some of Billings's original ideas, one based on the use of punched cards and in which electricity was applied to the principle of the Jacquard loom. Once he had a firm idea of what his system was to be, Hollerith began the processes of raising money, devising auxiliary devices, applying for patents, organizing his business office, and ultimately demonstrating advanced models to would-be buyers. Well before the end of the decade, with all or most of the essential preliminaries taken care of, he considered his system ready for use in the census of 1890.⁵¹

⁵⁰ *Ibid.*, pp. 30-31. See also Virginia Hollerith, "Biographical Sketch of Herman Hollerith," *ISIS*, Vol. 62, Part I, No. 211 (Spring 1971), p. 70. Billings had little money to invest in such a project. Moreover, he had been financially burned by one or more failed commercial ventures earlier in his career. He also may well have sensed that there was not room enough in this proposed venture for two such dominating personalities. However, his governing reason for declining was probably a desire not to be drawn so far away from his intellectually rich and many-sided professional life.

⁵¹ For details, see the account by Geoffrey D. Austrian, *Herman Hollerith, Forgotten Giant of Information Processing* (New York: Columbia University Press, 1982), pp. 1-57.

Billings, for his part, while declining any commercial or other business involvement in Hollerith's system, retained an intense interest in possible applications of the apparatus and was highly confident of its ultimate success. He remained Hollerith's good friend as well as one of his most consistent and active supporters. Looking forward especially to fulfillment of the invention's potential for radically improving the processing of mortality data, he became a champion of the system at every stage and went out of his way to expedite its adoption, both in the census operations and elsewhere.

From the beginning, Billings also remained essential to Hollerith as one of the system's principal technical critics. One of the Billings daughters recalled the evenings sometime in 1882 or 83 when Hollerith went to the Billings home carrying the "first little wooden model" of his invention. The two men placed the model on a table in the library where they could observe its movements and sort out the pros and cons.⁵² Subsequently, Billings went to other sites for tests and demonstrations of later models, though at some of them he appeared not only as the critic but as the promoter and expeditor of the machine.

Billings apparently became persuaded of the essential workability of the system about as soon as Hollerith himself did, by late 1884. Almost immediately, he began to alert the public health profession and other specialists to the developments that were in the offing. Taking the news to the American Public Health Association in the following year, he linked the announcement to a lengthy discussion of a statistical dilemma that health officers of states and large cities were encountering at this time, a dilemma that had been discussed briefly at the National Board's recent conference on vital statistics. On the one hand, these professionals were under increasing pressure to publish health bulletins or reports at regular intervals, both for the public and for professional use, and to fill them not only with the basic facts of diseases and deaths but with numerous statistical charts, tables, and analyses that took into account their relations to certain sanitary and demographic variables or combinations of other circumstances. On the other hand, preparation of such statistics was costly and required the expenditure of an immense amount of time and labor by skilled individuals.

Billings's paper analyzed the different kinds of publications and tables, suggested means of simplifying them without reducing their usefulness, and, almost in passing, mentioned that one means of reducing statisticians'

⁵² Reported in Truesdell, *Punch Card Tabulation*, p. 31.

errors had just become available, while another was about ready. The first was his own contribution to the census operation of a simple substitute for the "large and clumsy" tally sheets that statisticians had long used for arranging and compiling death data. To take their place in processing the 1880 census figures, he had first recorded the data manually on post-card sized cards, one for each death, though since that time he had come to realize that it would be far preferable if such recordings were done by punching holes or slots.

Billings stressed to the sanitarians the fact that this changeover to recording on cards was of added importance because it was expected to be an integral feature of the second innovation, Hollerith's soon to be available tabulating machine. "It would be quite possible," he explained in 1885, "to have the punching of these cards done by machinery, by simply playing upon keys like those of a piano or a writing-machine, and after the cards had been punched, to have them distributed in various ways, and counted by machinery or by electricity. In fact, a method for doing this last has already been devised, and seems to work very well."⁵³

Although Billings's announcements to the APHA were understated as usual, they were the words of a thoroughly happy official. They conveyed the satisfaction of a statist who, as much as any of his hearers, stood to gain almost incalculably from the imminently available Hollerith machine. However, as before, unlike so many ambitious individuals of his generation, Billings was not diverted by the lure of a possible bonanza of financial gain. Rather, he looked forward to the huge bonus of efficiency and speed that the Hollerith machine would surely bring to his own statistical operations and those of his professional colleagues.

Billings does not seem to have spent much time reflecting on the relief that the machine might bring to statistical professionals from the crushing load of routine mental calculations and pencilled entries that had characterized and encumbered middle and late-nineteenth century vital statistics tabulation. In fact, as a workaholic, he appeared to regard such matters as being unworthy for health professionals to entertain very seriously, particularly in the face of undiminishing statistical work expectations, standards, and timetables. He was quite explicit about this in an 1887 paper to the APHA. Dealing again with the new data processing methods, he exhorted health officers to include

⁵³ JSB, "Methods of Tabulating and Publishing Records of Death," *Public Health, Papers and Reports*, 1885, Vol. XI (1886), pp. 51-65; the quotation is on p. 55. See also, JSB, *Vital Statistics of Tenth Census*, Vol. 12, p. clviii.

as much mortality data as possible on the cards they punched as well as to be unstinting in preparing additional tables for their reports, thereby paving the way toward improving the next census even if it meant additional statistical labors. The fact that these latter "will involve a considerable amount of labor in computation of ratios is true; but by the use of Thatcher's slide rule this labor may be much lessened. Such computations are essential to bring the data into such shape that they can be compared."⁵⁴

As Hollerith, during the mid- and late 1880s, perfected the tabulators, punches, sorters, and other components that were needed to be linked together in his system, Billings was helping make arrangements for field tests of the system in American health departments and registration offices. Tests began at the Baltimore Department of Health in 1887, at the New Jersey state registrar's offices a few month's later, and in the New York City health department in 1889. The Surgeon-General's Office of the Army installed one of the machines in 1888 for testing, while the Navy Medical Department deferred their decision in the matter until the Army's tests were completed.⁵⁵

Billings kept the public health community informed of the various early tests and generally alerted health officers to the features and capacities of the new machines. For some time, however, at least as long as those machines remained expensive and in short supply, he also kept reminding professionals that the punched cards, which were simple, inexpensive, and readily available, continued to be decidedly valuable even if used alone. In 1887, he argued "that the existence of such a machine [as Hollerith's] is a strong additional reason for the use of the card system of record for statistical

⁵⁴ JSB, "On Some Forms of Tables of Vital Statistics, with Special Reference to the Needs of the Health Department of a City," *Public Health, Papers and Repts*, 1887, Vol. 13 (1887), reprint, p. 4.

⁵⁵ For further details of the trials, see Austrian, *Hollerith*, pp. 39-57; also Truesdell, *Punch Card Tabulation*, pp. 32-47. For the introduction of the device in the Army, see Albert G. Love, Eugene L. Hamilton, and Ida L. Hellman, *Tabulating Equipment and Army Medical Statistics*, (Washington: Office of the Surgeon General, Department of the Army, 1958), pp. 30-51. The later adoption of such technology in British censuses and vital statistics is examined by Edward Higgs, "The Statistical Big Bang of 1911: Ideology, Technical Innovation and the Production of Medical Statistics," *Soc. Hist. of Med.*, vol. 9 (1996), pp. 409-426.

computations. The punched cards cannot, of course, take the place of the written registration records which are required for judicial purposes,—they are an addition, and not a substitution,—but the facilities which they give for statistical work are so great that I advise their use in all cases, no matter whether they are to be counted by machinery or not.”⁵⁶

Throughout the 1880s, neither Billings nor Hollerith faltered in their shared conviction that the latter would have a successful tabulating machine system ready for installation in time for full use in the 1890 federal census. By 1889, the machine had convincingly passed the tests conducted in Baltimore, New Jersey, New York, and the Surgeon-General’s Office, while potential customers had begun clamoring for it on both sides of the Atlantic. The selection of Robert P. Porter to be the new Superintendent of the Census, greatly simplified its final adoption in that agency.

A personal friend of Hollerith, Porter was already advocating the invention’s early acceptance.⁵⁷ He was also well aware of the unique role that Billings had been playing as Hollerith’s supportive but critical alter ego in the government during the period between censuses. And he saw that his census administration stood to benefit from a continuation of the relationship while the machines were being placed into service.

As one of his key appointments, therefore, Porter was all too happy to select Billings to return as head of the Vital Statistics Division. He had been personally familiar with the latter during the 1880 census and was well aware of his excellent record. Moreover, the two men shared a common interest in carrying over many of Walker’s methods and innovations from 1880 to the new census enterprise.⁵⁸

There seems to have been little if any disagreement among the other upper echelon census officials who came together with Porter and Billings about the urgent need for improved data processing methods. But there were some initial differences over which of several systems should be adopted. To resolve them, Porter and the Secretary of the Interior appointed a committee composed of Billings as chairman and two other census experts to make an investigation and evaluation. In the fall of 1889 the committee organized and conducted a competition that pitted Hollerith’s electric tabulating system

⁵⁶ JSB, “Some Forms of Tables,” *loc. cit.*, p. 5.

⁵⁷ Reviewed in Austrian, *Hollerith*, pp. 39–49.

⁵⁸ Robert P. Porter to the Honorable Secretary of the Interior, May 3, 1889, photocopy, in JSB Papers, NLM.

against two essentially manual systems, one devised by the census statistician William C. Hunt, the other by Charles F. Pidgin, a Boston inventor. For the test, Billings and his committee had the competing devices process actual population data that had been gathered from selected districts of St Louis in the previous census. The systems were then evaluated according to the time they took, first to transcribe the data from the original census schedules to the punch cards, slips, or chips of the respective systems, and then to tabulate the data.⁵⁹

The competition took place in September and October, but the outcome became evident long before all steps had been completed, with the Hollerith system far surpassing the other two in virtually all aspects of its performance. Weeks prior to completing his committee's final report, in fact, Billings recommended to Porter that the Hollerith system be adopted for the forthcoming census, and that an immediate order be placed for the first six machines needed to start the data processing in the vital statistics division. Porter accepted both proposals and lost little time having contracts with Hollerith prepared.⁶⁰

Around this point in time, Billings's relationship to the Hollerith invention and system necessarily began to change. To be sure, he kept an enthusiastic and observant eye upon the machines as they arrived from the factory and were physically installed in the census building. He readily gave his views on the training of staff in running them. And he remained available to Porter and his staffs to answer questions about the system's use in the census operation. Likewise, when the American Association for the Advancement of Science met in Washington in 1891, Billings arranged a tour and demonstration for the members on the machines that the census was starting to use.⁶¹ Otherwise, however, by then he was referring many of the questions to Hollerith, who had an office on the premises. He also steadily phased out his role as critic and promoter of the machines as Hollerith took on more of such functions himself.

⁵⁹ See Austrian, *Hollerith*, pp. 50-51; and Truesdell, *Punch Card Tabulation*, pp. 40-43.

⁶⁰ See Austrian, *Hollerith*, pp. 50-52.

⁶¹ JSB, "Mechanical Methods used in Compiling Data of the 11th United States Census; with an Exhibition of a Machine," (Abstract), *Proceedings of the American Association for the Advancement of Science*, 40 (1891), pp. 407-409.

Instead, with the systems' integration into the new census operation, Billings's interests inevitably shifted to the actual use of the machines, to the statistical processing of the large new quantities of data that they generated and processed. Fully as much, moreover, his attention moved on to a host of other scientific and managerial challenges connected with the vital statistics of the nation's 11th Census.

Chapter 8

National Vital Statistics and the Great Census of 1890

News of the successful testing of the Hollerith machines and of their planned adoption for the Eleventh Census of the United States stirred up widespread interest during the 1880s. In fact, as 1890, the year of the actual census event, approached, considerable excitement and sense of anticipation was built up, not only among the involved government professionals, statisticians, and other specialists but among academics and intellectuals generally. And, when the results began to be published by the respective census divisions, the various users and fans seem to have been widely satisfied. This was at least true of Billings's Vital Statistics Division and the two other divisions for which he was responsible.

Billings's personal involvement in the development and testing of the Hollerith tabulating system during the 1880s helped ensure a virtually seamless transition for him from the work of the tenth census to that of the eleventh. He was as aware as anyone of the revolutionary effects that the Hollerith system would have on many aspects of the eleventh census. However, his primary interest remained the use of the system for processing the ever increasing quantity of mortality statistics nationwide. As a technical innovation, the system was intended to allow a new large-scale exploitation of data, of those from the death enumerations and those from the death registration area alike. Moreover, it brought to his Vital Statistics Division the capacity to greatly expand and refine the processing of the factors bearing on mortality that Billings was interested in examining.

Statists in the Land: Census Experts and Administrators

By the fall of 1889, the organization of the eleventh census had been substantially completed under the new superintendent, Porter, and preliminary tasks were under way. Porter, apparently desirous of gaining

public support for his sizeable enterprise, persuaded several editors to prepare and run special articles in their periodicals about the plans for the upcoming operation. In October, one of these, *Frank Leslie's Illustrated Newspaper*, carried an account that included summaries of the missions of the principal divisions, photographs of Porter, Billings, and the other chiefs, a few data on numbers of employees, field procedures, and publications, and sketches of the two large buildings where the Washington operation was housed. Impressed by the statistical significance of the impending census, the writer reminded his readers that, preparatory to carrying it out, "the omnipresent statist will soon be abroad in the land Already the murmuring of the mustering statistical hosts may be heard from Washington, in the appointment of special agents, statistical experts, and 'sharps', as they are termed. The next two years will be the statistical harvest-time, and the merry reaper, whether expert, sharp, special agent, or enumerator, will take his position in the broad field of information known as our national domain."¹

A large proportion of this statistical "host" that was being mustered for the census was made up, as usual, of the temporary field enumerators and supervisors that were spreading through the respective states. Another sizeable number was composed of professional registrars or statisticians in academia, industry, or local government who were being asked to serve, mostly from a distance, as consultants or suppliers of special kinds of data. However, the core of the contributors was made up of the administrators, planners, technicians, and analysts who were being brought to Washington for varied functions over the seven or eight years of the preparation and processing of the census. Many of those were coming to fill jobs in the lower echelons of the census's central office operations, while Porter was selecting seven or eight of the most prominent individuals along with Billings for his immediate staff.²

This upper echelon of experts, most of whom were division heads, did not include any mathematical statisticians. However, it had a strong

¹ *Frank Leslie's Illustrated Newspaper*, October 12, 1889. Other articles appeared in *The Philadelphia Press*, Nov. 3, 1889; and *Scientific American*, Aug. 30, 1890. The cover of the latter periodical featured illustrations of the work processes and mechanical devices of the Hollerith system, which gave the census enterprise a truly new look.

² For brief general summaries of this census, see Anderson, *American Census*, pp. 104-110; and Wright, *United States Census*, pp. 69-76.

complement of experienced applied statisticians. Five of the eight, including Billings and Porter, had worked with Walker on the 1880 census, while four in addition to Billings were on loan from positions as statisticians in federal bureaus in Washington.³ The members of this group went on to serve together through long portions of the eleventh census's existence. However, relatively little professional cohesion seems to have developed between most of them, either as administrators or statisticians, with the conspicuous exception of each individual's relationships with the Superintendent.

A political appointee and non-professional, Superintendent Porter, in sharp contrast to his predecessor, Walker, had relatively little standing among American statisticians. However, he generally deferred to the expert statisticians on his staff and seemed to have their support. With respect to Billings, he was impressed not only by the latter's statistical accomplishments and technological bent but by his organizational abilities, businesslike approach, and reputation for reliability. From the beginning of their relationship, Porter wisely left him largely free to run his own show without interference. He accepted Billings's objectives for the census almost without question. And he seems to have readily supported the other's requests for funds and other resources, including the detailing of a male stenographer to the Army medical museum and library to accommodate Billings's work habits.⁴

In turn, the Army man acted the part of the consummate civil servant. Above all, he made sure that the Superintendent was kept fully informed about what was going on. He accomplished that through a constant flow of letters and reports to Porter, communications in which he laid out his ideas and objectives in detail, kept the other apprised of progress being made, and let him know of any needs to modify plans or obtain more funds.⁵

Billings's ties with the other members of Porter's immediate staff varied considerably. He apparently had no work relations at all with the chiefs of the census's divisions of manufactures, transportation, or mines and

³ Truesdell, *Punch Card Tabulation*, pp. 217-219.

⁴ U. S. Census Office, "Memorandum of property in the Army Medical Museum Building belonging to the Census Office," 4/26/1893, Ms in JSB Papers, NLM.

⁵ This paragraph is based on my examination of the contents of a sizeable collection of Billings's correspondence with Porter between 1889 and 1893, in JSB Papers, NLM, especially letterpress books #152 and 153.

mining.⁶ He did maintain crucial links with the capable Chief of the Population Division, William C. Hunt, particularly to ensure the smooth flow of certain kinds of data from that Division that were essential for some of the calculations and publications of the Vital Statistics Division. Billings also came to rely heavily on the Geographer of the Census, Henry Gannett, for the preparation and supply of maps, diagrams, and other kinds of illustrations for his intended publications. The two had collaborated at least once before, in ways that had greatly enhanced the value of Billings's vital statistics reports of the tenth census. H. G. Funkhouser has pointed out that those publications included, among other forms of illustration, not only "many age pyramid" graphs but also polar diagrams, a type of graph not previously used in censuses.⁷ Now, planning his various publications for the eleventh census, including a portion of its *Statistical Atlas*, Billings sent Gannett several large shopping lists: for such items as maps in color, others in black and white, diagrams, and cartograms, some of the latter in six shades of color.⁸

Billings also came to have substantial dealings with certain professionals who had permanent positions in the Interior Department. One of these was the statistician James H. Wardle, who managed unfinished census affairs during the interim between the tenth and eleventh censuses and then served as the census's chief clerk (administrative director) during the early 1890s. A more widely known figure was the Commissioner of Labor, Carroll D. Wright, who as an additional duty, succeeded Porter as census superintendent in 1893 on the expiration of the latter's appointment.

Although Billings had no special involvement in the statistics of labor reform, he was well aware of Wright's important work in that field, first in Massachusetts and since 1885 in Washington at the Interior Department. The two also knew each other as members of the American Statistical Association; during the late 1880s both were office-holders in that body.

⁶ These individuals were Frank R. Williams for manufactures, Henry C. Adams for transportation, and David T. Day for mines and mining.

⁷ H. Gray Funkhouser, "Historical Development of the Graphical Representation of Statistical Data," *Osiris*, Vol. 3 (1938), pp. 341-342. Funkhouser viewed the 11th Census's *Statistical Atlas*, to which Billings also contributed, as being one of the high points of American graphics. See also Wright, *United States Census*, p. 68.

⁸ JSB to Porter, 9/9/1890, JSB Papers, NLM, letterpress book #153; and B. to Gannett, 6/18/1894, B papers NLM, letterpress book "from May 14, 1889."

As a result, with much in common both as statisticians and as government administrators, the two became mutually supportive as colleagues in the later phases of the 11th Census. They sometimes found occasion to work in tandem in order to advance the quality of statistical methods in government. They also shared strong views about the need for a permanent census office and labored together during the '90s, both in the government and in some of the professional organizations, to advance that objective.⁹

Like most of the other senior members of the 1890 census hierarchy, Billings was engaged as an advisory division director who would carry out varied part-time responsibilities under the generic title of expert special agent. As in 1880, he was first and foremost the effective head of the Vital Statistics Division. However, for the new census he also took on the general supervision of two of the other divisions as well: Social Statistics of Cities, and Special Classes. Each of the three divisions had its own full-time operating chief, an expert in his own right who managed the day-to-day administrative details as well as the routine statistical and technical labors of the staff. These were the individuals through whom Billings channeled his plans for the census operation. W. H. Olcott performed this role in the Special Classes Division, while Harry Tiffany and John D. Leland filled it successively in the Social Statistics of Cities Division. By far the most important for Billings, however, was the competent and loyal managing head of the Vital Statistics Division, William A. King.

Persons outside the census enterprise sometimes gained the impression that Billings himself was the full-time executive manager of each of these units, a belief that he occasionally attempted to correct. "My position," he wrote, "is that of an advisor of the Superintendent as to the data which should be collected in the Divisions of Vital Statistics, Social Statistics of Cities, and Statistics of Special Classes, and as to the forms on which these should be tabulated and the illustrations required. I have very little to do with the details of carrying out of the work which is managed by the Chiefs of Divisions, and absolutely nothing to do with appointments . . ."¹⁰ The historian may wonder how many people actually took Billings strictly at his word on this matter, for his long record as a "hands-on" director or administrator was

⁹ James Leiby, *Carroll Wright and Labor Reform: The Origin of Labor Statistics* (Cambridge: Harvard University Press, 1960), p. 127. The Wright items in NLM's Billings papers deal mostly with routine administrative matters of the census.

¹⁰ B. To W. Godwin Moody, 9/12/1890, B. Papers NLM, Box 25, letterpress book #153.

well known. There is much evidence that he frequently went far beyond the mere giving of advice to the three division chiefs. Moreover, from the beginning he was expected by all to take full active charge of the analytic, writing, and publication activities of the divisions.

Billings's three divisions differed in scope, complexity, and extent, as well as in the kinds of outside experts and collectors they used. Understandably, by far the largest portions of Billings's time, energies and concerns in the 11th census went into his work with the Vital Statistics Division. Reflecting that unit's obvious importance, one of his most urgent steps upon being reappointed to the division was to try to obtain King, his valued associate in the tenth census, once again as its operating head. Porter concurred in this selection in May, 1889, and Billings apparently needed to do but little arm-twisting to gain King's acceptance. The latter seems to have welcomed the idea of the imminent resumption of their close work relationship as much as the former did, though he needed over two months to wind up his affairs in Pueblo, Colorado before he could resettle in Washington.

In their correspondence over the next several weeks, the two men sorted out the responsibilities and terms of King's upcoming position, including a salary of \$2,000 plus possible extras; Billings promised to get him all the compensation that the law would permit. Billings also brought King up to date on pertinent developments since completion of the tenth census and, most important, his plans for the new census, in most of which King was to be intimately involved. Selections for some of the other staff appointments in the Vital Statistics Division, he noted in May, were well advanced, including that of a prospective Assistant Chief, but there was likely to be much competition from the various other census divisions for available skilled clerks. Billings added that he had already planned for the work of copying death registers from the registration area to start in January and to be mostly done by the following June. He also mentioned his new connections with the other divisions, though King would not normally have responsibilities in them except to furnish ratios of mortality. In the Vital Statistics Division, King at the start was to be in charge of processing only the same kinds of statistics that he had directed in the 10th census, but Billings hoped that, as the work progressed, the other man would have time to organize the processing of certain other kinds of data as well.¹¹

¹¹ B to King, 5/24/1889, unnumbered letterpress book, "From May 14, 1889," B papers NLM, Box 25.

Soon after King came aboard, in fact, Billings committed the division to fitting in an investigation of vital statistics among a cross-section of the Jewish population of the United States. Since adequate data for such a study were not available from registration records, Billings arranged to have a special agent in Washington, A. S. Solomons, distribute copies of a special inquiry to about 15,000 heads of Jewish families around the country. Responses for some 60,000 individuals ultimately came back to the division. These included basic birth, marriage, and death data which were then arranged by sex, age, locality, occupation, birthplace of mothers, and other factors, and were also compared with Jewish experience in Europe.¹²

In another early letter, Billings brought King in on the planning for use of the Hollerith system. The final decision for its adoption came just before King arrived back in Washington.¹³ With this decision settled, Billings began to outline substantially more ambitious goals for King and the rest of the Vital Statistics Division, including himself. This included specifying quantitatively higher levels of production that reflected the anticipated capacity and speed of the machines. He thought there would be around a million deaths to take into consideration and said that he planned to have the data for each one transcribed for use with the machines. Generally speaking, his intent was to "have much more copied from registration records than was done in the last census." Going on, he also specified "rather elaborate" new tables of deaths that he wanted, arranged by color, occupations, and marital condition, while "the distinctions as to localities will be finer than they were in the last census. I shall, also, add about six diseases and groups of diseases to Table XIII." Turning to other matters, Billings alerted King to additions that had been made to the registration area as well as to the fact that physicians were again being asked to send in their registers of deaths. "I expect," he wrote, "to use the physicians' registers in the same way as was done the last time . . ."¹⁴

Once King was back at work, Billings could devote more of his time to the task of reactivating and extending the Division's ties with statistical experts around the United States, specifically his network of health officers

¹² JSB, "Vital Statistics of the Jews in the United States," *Census Bulletin*, No. 19 (1890), pp. 3-23.

¹³ B to King, 5/24/1889 and 6/7/1889, B papers NLM, Box 25, letterpress book, "From May 14, 1889."

¹⁴ *Ibid* (i.e. B to King, both letters).

and registrars from registration states and cities. These, of course, were the individuals who were needed to authorize and arrange for the copying of and supplying the Division with certified mortality data, a process that remained the core element in the census's continuing contribution to vital statistics reform. When the division resumed operations, King and his assistants as before monitored details of this inflow of data as well as doing the subsequent processing. Usually the supply phases of the operation were fairly easily carried out, particularly where local officials had previously collaborated in such work for the 1880 census. However, some transactions were complicated and time consuming. In Pittsburgh, special copyists became needed when clerks of the local Registrar's Office declined to perform any copying at the rate of compensation that was offered.¹⁵ And at some other locations, King had to send some of his own clerks to assist in finishing the copying.¹⁶ For everyone in the division, the finding of solutions for the glitches in making copies was a matter of urgency, a matter that had to be worked out before the division could get down to the heavy load of machine punching, tabulation, and other processing that Billings had laid out.

The Special Classes Division did not require anything approaching the amount of attention that Billings gave to the Vital Statistics Division. However, its work of enumerating and handling of information on the insane, the feeble-minded, the deaf and dumb, and the blind was of interest to him, particularly since the Hollerith machines were to be used in processing the data. At the same time, like earlier analysts of such data, Billings contributed to that division's efforts to supplement the census figures with statistics from state and local censuses as well as from records of hospitals, special schools, and other institutions and interest groups.¹⁷ In his efforts to augment the data on the deaf, for instance, he took advantage of one of the special interests of his near-neighbor and friend in Georgetown, Alexander Graham Bell. Among other ideas, the latter suggested canvassing schools for the deaf for lists or figures of all former as well as current students. Late in 1889, on Billings's request, Bell also reviewed the division's plans to add several new inquiries to

¹⁵ B to Porter, 2/6/1890, B papers NLM, Box 25, letterpress book 152.

¹⁶ B to King, 11/19/1890, B papers NLM, Box 25, letterpress book 153.

¹⁷ JSB, *Report on the Insane, Feeble-Minded, Deaf and Dumb, and Blind of the United States at the Eleventh Census: 1890* (Washington, D.C.: G.P.O., 1895). Billings and Olcott also published extracts from this report as brief special bulletins of the census.

enumeration schedules pertaining to all of the special classes, not just the deaf. In turn, during the '90s, Billings collaborated modestly with Bell on a project of the latter's Volta Bureau to develop mortality tables for the deaf.¹⁸

Measuring Urban Population Ills: The Census and Public Health

Billings intervened to a greater extent in the work of the Division of Social Statistics of Cities than he did in that of Special Classes. In fact, he was able to link portions of that work closely with his ongoing personal interests in public health and vital statistics. As in the 1880 census, this division initially relied almost exclusively on numerous local experts, agents or contractors for its supply of statistics. Those individuals furnished a wide variety of data pertaining to the individual cities of the United States: from modes of transport to places of amusement, from boards of health to the dog population, from churches and other public institutions to saloons and cemeteries. However, in 1890 Billings asked them to focus their fact-finding more narrowly, to reduce the amounts of descriptive, historical, topographical, and other background material that had been prominent in previous reports. This change led to a final census document that was shorter than its predecessor and that placed greater emphasis upon the statistics per se, together with their analysis and their illustration by graphs, maps, and special tables.¹⁹

At the same time, Billings canvassed officials and agents in the country's larger cities for special information pertaining to streets, waterworks, sewers, fire and police departments, and other elements of urban administration and the infrastructure. When these data came into the division, he had them sorted, arranged and compared with respect both to individual municipalities and to groupings according to population size, physical space, geographical region, costs, and other factors.²⁰ Of interest for many persons, it turned out, were data reflecting the early impact of the age of electricity on the cities. Hardly a dozen years after commercial arc-lighting was installed on Philadelphia's streets, the census showed that electric street lamps were already rapidly replacing gas lamps in American municipalities.²¹

¹⁸ Bell to JSB, 12/21/1889; John Hartz to B, 12/3/1892, JSB papers NLM.

¹⁹ JSB, *Report on the Social Statistics of Cities of the United States at the Eleventh Census: 1890* (Washington, D.C.: G.P.O., 1895).

²⁰ JSB, "Social Statistics of Cities," *Census Bulletin*, No. 100 (1891), pp. 3-27.

²¹ *Ibid.*, p. 8.

Few of the statistics were more striking, however, than those that highlighted the population increases of American cities during the intercensal decade of the 1880s. Studying them even before the census processing was completed, Billings was able to sketch and make public some of the outlines of the phenomenon. Not least in significance, the number of cities with 10,000 or more inhabitants had grown from 219 in 1880 to 345 in 1890, an increase of 58% representing over six and a half million individuals. While the older states of the Northeast still led in the numbers of cities in this size range, he was impressed that the North Central region had had a gain of 50 such cities during the same period, while even the Western states had increased by a total of thirteen such cities. In Kansas, Minnesota, Nebraska, Colorado, and Oregon, moreover, the populations living in cities of over 10,000 increased by 194 percent or more.²²

These statistics of a rampant urbanism in the West high-lighted the obverse of some of the Population Division's statistical maps of that region, conspicuously those that traced the inexorable shrinking of the areas of free land under the pressure of increases in population densities. Billings had abundant opportunities to examine drafts of those maps and the statistics on which they were based as he prepared his analyses for the Social Statistics of Cities Division. However, he had little time during this period to linger over the population trends of the western frontier. Rather, his attention, by and large, was concentrated on the mortality and sanitary statistics of America's most densely populated urban areas of settlement, mainly east of the Mississippi.

As soon as Billings began his work with the Eleventh Census, he had proposed and launched a large special inquiry into these matters, but one that would draw on the expertise, energies, and data of the Division of Vital Statistics more than those of the Division of Social Statistics of Cities. Briefing Porter in 1889, he outlined a plan to greatly expand the census's statistical scrutiny of mortality in America's largest metropolises, specifically the cities of over 100,000.²³ It was to be a cooperative pilot project, a demonstration of the new capabilities of modern census offices and local

²² *Ibid.*, p. 3.

²³ JSB to Robert P. Porter, May 14, 1889, JSB letterpress book, "From May 14, 1889," JSB papers NLM. Billings was well aware of the uses of census data by British sanitarians, medical officers of health, and others in their medical and public health investigations.

health departments working together. It was also to be a demonstration of the use of statistical methods in combination with the Hollerith technology, of the analysis of newly reliable mortality data along with other local health and social statistics in order to better understand the circumstances of urban sickness, death, and health.

The ideas for such a project had come together and gained support through the 1880s as Billings got deeper into census work. And he early realized that any such undertaking would be feasible only with the continuance of his fruitful ties with America's local health officers and registrars. The original links were with officials who participated in the successful death registration area arrangements; he worked especially closely with individuals in the large cities since they furnished large proportions of the census's certified mortality data. Beginning around 1885, additional links formed between Billings and the public health community as the implications of punched card records and the emerging Hollerith machines for vital statistics processing and inquiry began to be discussed. Writing in a number of professional papers, Billings took on himself the task of explaining the new methodologies and how to apply them to the statistical work of local health offices. In the process, his ideas gained acceptance as indicating the right way to do such things as organizing routine vital statistics functions, conducting health investigations, and preparing health department statistical reports. Whether intended or not, the papers also helped materially to pave the way for further collaborative projects with Billings and the census in the future.²⁴

Billings and the city health officers now also attempted to resolve some older questions about investigations and reports. Of particular importance, by 1885 they had begun to reach agreement as to which of the circumstances that bore significantly on every death should be factored both into the census inquiries and into the cities' regular health reports. The majority agreed with Billings that around ten such factors, each with sub-factors, were all that could be feasibly handled—among them: sex, age, color, cause

²⁴ See JSB, "Methods of Tabulating and Publishing Records of Death," *Public Health Papers and Reports, American Public Health Association*, Vol. 11, (1885), pp. 51-65; and JSB, "On Some Forms of Tables of Vital Statistics, with Special Reference to the Needs of the Health Department of a City," *Public Health Papers and Reports, American Public Health Association*, Vol. 13 (1887), pp. 203-223.

of death, occupation, and race—and even then only in the federal census and in those states and large cities that could afford the costs of intensive statistical processing.²⁵

Another basic element in planning almost any mortality or health related inquiry was (and is) the factor of locality, the geographical focus of the investigation. In many cases at that time this focus was the city. However, in the larger nineteenth century cities, American as well as European, health officials were tending to divide the area of investigation into smaller locality units that were more feasible administratively and more useful epidemiologically. In the United States, it was originally the ward that was most frequently selected to serve as such a unit.

During the 1880s, Billings considered it imperative that the urban health officer, in analyzing mortality and other statistics to determine where sanitary work was most needed, “have the information from individual localities . . . as well as for the whole city.” He urged that such information “must as a rule, be in the form of percentages or ratios, in order to permit of comparisons” between the various localities. Still, he protested that the ward was not always the appropriate locality unit for such investigations. The problem was that some cities delineated their ward boundaries “for purely political purposes,” as Baltimore had at that time. In such cases, he pointed out, “the ward divisions are absolutely useless for the purpose of the sanitarian and statistician, and should be abandoned.”

In their place, Billings advised urban health officers to make their own rational choices as to locality units. While the ward could still be selected when appropriate, in a large proportion of cities the desirable solution was to divide large existing wards into one or more variously sized subdivisions, or “sanitary districts.” Instead of political considerations, the basis for forming such districts, he argued, must be “in accordance with the topography and the character of the population,” with topography being considered in its broadest senses. In other words, the mortality investigation of each district would gain immensely in both social and medical significance by factoring in a selection of the social as well as environmental features that were peculiar to the district—the patterns of housing; predominant occupations, elevations of terrain, meteorological peculiarities, waste removal facilities, wealth or poverty of the inhabitants, and other factors as appropriate.²⁶

²⁵ JSB, “Methods of Tabulating and Publishing,” *loc. cit.*, pp. 51-52.

²⁶ *Ibid.*, pp. 51, 56.

Thanks to his linkages and highly practical decade-long interchanges with individuals in the public health community, Billings had already assembled a comprehensive set of ideas for an urban mortality inquiry well before the organizational phases of the 11th census began in mid-1889. Moreover, he and the large city health officers were largely in agreement as to matters of its content, methodology, and organization. There was thus little if any surprise, for instance, when he made the sanitary district concept a central feature of his plan for the study. There was likewise only limited suspense over his choices of individual cities for the project: six east-coast communities were ultimately selected: Baltimore, Boston, Brooklyn, New York, Philadelphia, and Washington. Billings had originally suggested giving special attention to eight cities and even considered as many as seventeen for a time. Those that he finally picked were required to have effective death registration systems, while their officials had to be willing and able to finance and organize the special mechanisms that were called for, such as surveying and setting boundaries for their sanitary districts and enumerating their respective hygienic attributes. It was also imperative that those operations be completed in timely fashion, some of them well before the actual census enumerations of June 1890.

This early planning, assembling of resources, and firming up of work assignments for his three divisions characterized the first of the two especially busy and demanding periods for Billings during the eleventh census. Once those first matters were taken care of, there was a period of relative lull for him while King's technicians carried out their mainly routine tasks of collecting and copying data, entering them on punch cards, tabulating, and performing preliminary analyses. Occasional reprieves, of course, were necessary to allow him to fulfill his commitments in the medical library, in other segments of the Surgeon-General's Office, in academia, and elsewhere. But he also used portions of such time for occasional census trouble-shooting, for seeing that deadlines were met, for periodic consultations on the design or content of maps and other illustrations, and for preparing monthly status reports.

The second major phase of Billings's labors as census expert, one that took large portions of the period 1892-1896, had to do with the intellectual analysis, arrangement, writing, and hoped-for publication of the results of the census. In fact, by late 1890, as soon as substantial amounts of data arrived in Washington, he and his staff were preparing a number of preliminary bulletins or special reports on particular topics. Each of his three divisions ultimately issued one or more such documents. By 1896, however, in many cases, their contents had been expanded and merged with much other related data to make up the huge final reports.

Billings characteristically gave close attention to all aspects of the preparation of these reports. However, when they were actually published, he undoubtedly took special satisfaction with the tome of some 1100 pages that dealt with the health and mortality of American cities of over 100,000 population. Actually, all but a small part of that volume pertained to the six cities of Billings's special study and had been issued earlier as three separate monographs: the one for the District of Columbia and Baltimore in 1893; for New York and Brooklyn in 1894; and for Boston and Philadelphia in 1895. These were detailed technical treatments for the health officers and registrars, the epidemiologists, the census statisticians and demographers, the city planners and other professionals. While by no means perfect in every detail, these were works which, in the aggregate, constituted America's most ambitious pre-1900 sanitary survey as well as one that brought a distinctive new level of statistical sophistication to the genre. They also included a far larger intellectual contribution on the part of Billings than most of his other reports did and, as such, were probably most influential in extending his standing among professionals as statistician, epidemiologist, and demographer. His special contribution was to provide extended analyses and interpretations of the numerous tables and charts in each volume, presentations that were strictly factual and lacking in theory or speculation. He analyzed the paired cities both separately and together and compared their mortality rates as they related to the various factors. Maps in color showed the distribution of major causes of disease.²⁷

During the same period, Billings also prepared several short articles that summarized portions of these census findings for *The Forum* and its audience of mainly non-technical readers. The result was a series of up-to-date public health profiles of the six American metropolises at the juncture of old and new. These provided glimpses of sanitary districts in which traditional

²⁷ JSB, *Vital Statistics: Cities of 100,000 Population and Upward* (Washington: GPO, 1896), in JSB, *Report on Vital and Social Statistics in the United States at the Eleventh Census, 1890* (Washington: GPO, 1894-1896), Part II; JSB, *Vital Statistics of the District of Columbia and Baltimore Covering a period of six years ending May 31, 1890* (Washington: GPO, 1893); JSB, *Vital Statistics of New York City and Brooklyn, covering a period of Six Years ending May 31, 1890* (Washington: GPO, 1894); JSB, *Vital Statistics of Boston and Philadelphia, covering a Period of Six Years ending May 31, 1890* (Washington: GPO, 1895).

sanitary services and modern bacteriologically based facilities, together with their respective philosophies, of necessity often coexisted at that particular moment in history. On the one side, he thus was able to review the status of municipal sewer, water, and street cleaning systems, along with environmental cleansing activity generally, and to consider any possible relationships, however remote, that they might have to the incidence of damaging crowd diseases. On the other hand, he examined the impact of such factors as the presence of infectious disease hospitals and the provision of quarantine, disinfection, vaccination and other services in the health departments, while noting the special urban circumstances that affected death rates of tuberculosis, diphtheria, scarlet fever and other diseases known by then to be caused by microorganisms.²⁸

Although most of the technical matter of the original reports was stripped off, Billings designed these *Forum* articles to focus above all else on the findings of the mortality statistics. In each article, he drew attention to contrasts that the survey showed in the death rates of various racial and ethnic populations in the several cities and their respective sanitary districts. In Washington and Baltimore, differences between the white and black populations stood out; in New York and Brooklyn, those between various large ethnic populations of the tenements were noteworthy; while for Boston, the high rates among the concentrations of Irish living in tenements contrasted forcefully with the lower death rates of virtually all of Philadelphia's population segments, most of whom then lived in single-family houses. For all of the cities, he also drew attention to the high infant mortality among many of the population groups.

In these articles, Billings occasionally made public one or another of his statistical frustrations. Among those was his impatience over the continued lack of sickness statistics, while even the most refined mortality statistics that he had been able to obtain during the eighteen nineties seemed to be marred by insuperable limitations. Even his main 1890 census study had not been able to take into consideration many of the large general influences on urban mortality, including the economic, cultural, sociological, and

²⁸ JSB, "Municipal Sanitation Defects in American Cities," *Forum*, Vol. 15 (1893), pp. 304-310; JSB, "Municipal Sanitation in Washington and Baltimore," *Forum*, Vol. 15 (1893); JSB, "Municipal Sanitation in New York and Brooklyn," *Forum*, Vol. 16 (1893-1894); JSB, "The Health of Boston and Philadelphia," *Forum*, Vol. 17 (1894).

other factors. In fact, there were so many unknowns in those areas that he could not see how any fully satisfactory larger study of death rates could currently "be effected by the purely statistical method of research, because the obtainable data are imperfect, and more or less inaccurate, and because temporary and local conditions cannot be sufficiently taken into account by it." For the foreseeable future, he warned, some of the statistics from such studies would probably remain so incomplete that they would have to be used cautiously and selectively.²⁹

Nevertheless, Billings had no difficulty in identifying, from the 11th census statistics, exactly what he considered to be the most serious urban American public health problem of that period. This was the tragically high death-rate among blacks, especially as highlighted by the experience of Washington and Baltimore. It particularly demanded attention, he thought, because there was "not much reason to think any marked lowering of this death-rate can be effected by municipal engineering methods, or by legislation which can be practically enforced at present." Moreover, the causes seemed to lie in the murky and apparently unending cycle of "poverty, ignorance, and uncleanness," and related conditions in the lives of the blacks, as in those of other slum dwellers. "One of the grave questions of the day," Billings went on, speaking for philanthropists, politicians, and social thinkers, as well as for his generation of statisticians and health officers, was whether or not it was possible to reduce excessive death rates that were rooted in such conditions. But, equally important was the question, "'To what extent and in what manner is it expedient to attempt to bring about such reduction by municipal regulations and authorities, and at public expense.?" He noted that any attempt at the strict enforcement of such laws in Baltimore and Washington "would make it impossible for the poorer class of colored people to live in those cities at their own cost. To force them to go elsewhere, and thus increase the burdens of some other locality, is not a solution of the problem; to provide for them in institutions at public expense and allow their family life to be maintained, is impracticable." Billings saw little current chance of solving this dilemma in any city in the United States except possibly Washington. And even there, if some such attempt were to be decided upon, "it will be necessary to change slowly, for great evils may be easily produced by such interference."³⁰

²⁹ B, "Sanitation in Washington and Baltimore," *loc. cit.*, pp. 730-731.

³⁰ *Ibid.*, pp. 736-737.

This venture into some of the late-nineteenth century's core "problems of social pathology and pauperism" was neither very extended nor at all characteristic of Billings. However, his restraint in discussing them was highly typical. As a career Army medical officer, he had habitually suppressed his personal opinions on social issues as well as on politics. Moreover, while he shared some of the prevailing social prejudices and fears of his white Anglo-Saxon Protestant middle-class neighbors in Washington, he was constitutionally opposed to using his writings to stir up public alarms in connection with them. The same could not be said, in the early 1890s, about Billings's former census colleague, Francis Walker. In fact, no longer inhibited by government restraints, Walker began drawing from some of the new census population data to support a highly conservative social and political agenda which he broadcast in alarmist articles in *The Forum* and other organs. Central in these were his pessimistic views of what he thought was a suddenly decreasing fertility rate of the white American racial stocks and their alleged steady degradation under the influence of the massive numbers of poverty-stricken and presumed inferior immigrants.³¹

Billings seems to have neither endorsed or criticized Walker's most extreme printed positions. Still, without mentioning names, he did touch upon some few of the other's basic ideas briefly, almost in passing. In 1892, for instance, in a review of demographic trends, he posed what he considered to be three "really interesting questions" about the world's population, each of which was well known to be a worrisome matter for Walker. The three were "namely, at what rates are the different groups increasing, how are they migrating and mixing, and what are the probabilities as to their future development?" When he dealt further with American immigration in this article, Billings proved to be close, not only to Walker but to many other analysts, in concluding that "the present migration to the United States will probably injure rather than benefit the great mass of the people of this country." However, the tone of his presentation distanced him from the way Walker wrote about immigration. He was rational rather than polemic, promoting constructive

³¹ For a detailed analysis of and commentary on Walker's position, as well as a review of the extensive historical literature about it, see Dennis Hodgson, "Ideological Currents and the Interpretation of Demographic Trends: The Case of Francis Amasa Walker," *Journal of the History of the Behavioral Sciences*, Vol. 28 (1992), pp. 28-44.

discussion rather than appealing to prejudice or exhorting to restrictive social or political action. Conceding the central importance of the issue for Americans, he called for an intellectual rather than an emotional approach to its solution: "Do we want the tide of immigration to continue at its present rate and of its present character? and—if it be agreed that we do not, is there any way in which it can be checked without running the risk of doing more harm than good?"³²

The following year, still studiously avoiding mention of Walker, Billings confronted Walker's bug-a-boo of a calamitously declining white American birthrate in a very direct but matter-of-fact and statistically informed manner. Systematically sifting through the abundant American census data for 1880 and 1890 and comparing them with European data, he arrived at a set of factual conclusions about the birthrate, none of which seemed to have surprised him. Among the most important, the data confirmed his belief that the decline was not something new in the 1890s but had been evident among American groups of all sections for well over a decade. The phenomenon had also been widespread over much of Europe, but there was no evidence that the American decline was related to any kind of white response to the massive immigration from Europe.

Actually, Billings concluded, the fall of the birth rate was not a demographic calamity at all, though he advised statisticians, demographers, and politicians to keep the phenomenon under observation. On the contrary, he rather guardedly suggested that it was a positive good. It seemed probable that "the most important factor in the change is the deliberate and voluntary avoidance or prevention of child-bearing on the part of a steadily increasing number of married people, who not only prefer to have but few children, but who know how to obtain their wish." Several factors seemed to him to have brought this state of opinion about: the accelerated spread of sexual information during the previous several decades; the lessening of the religious imperative for couples to have children; a rising standard of living; and changes in women's roles in society. Contrary to Walker's alarms, Billings concluded, "it does not appear to me that this lessening of the birth-rate is in itself an evil, or that it will be worth while to attempt to increase the birth-rate merely for the sake of maintaining a constant

³² JSB, "The Population of the Earth," *Chatauquan*, Vol. 16 (1892-93), pp. 527-530. For one of Walker's statements on this topic, see his "Immigration and Degradation," *Forum*, Vol. 11 (1891), pp. 634-644.

increase in population, because to neither this nor the next generation will such increase be specially beneficial.”³³

In the mid-1890s, at the end of the census cycle, after Billings completed his analyses of the census's data, it must have been tempting for him and many others to judge the census's accomplishments or successes largely in terms of the proven workability of the Hollerith system, the great numbers of data issued jointly by the new technology and the multi-tiered statistical echelons. However, the intellectual substance and meaning of the materials processed in the Division also remained of central interest for him and for large numbers of late 19th century America's public health specialists, physicians, and demographers, as well as for legislators, sociologists, and even historians. Moreover, they went far to confirm several of Billings's assumptions about late nineteenth-century America's demographic and epidemiologic configuration and changes.

Statistics Beyond the Census

Along with his debate with Walker, Billings had a particularly heavy correspondence during this time with a mix of individuals in the statistical and public health communities. Some individuals offered last-minute suggestions for changes in the census, others had requests for clarification of the data. Jacob Riis, author of *How the Other Half Lives*, wrote with a plea for pre-publication statistics on the numbers of school-age working children in New York, for use in a new book.³⁴ In turn, Juan Guiteras, the Philadelphia pathologist, asked where data on mortality differences between “higher and lower classes” could be found in the the census reports.³⁵ Meanwhile, the actuary Levi Meech attempted unsuccessfully to persuade Billings to include comprehensive life tables in his report. The latter had to reply that, as in 1880, the lack of adequate mortality records in many areas still made it impracticable to compile a life table for the entire United States.

³³ JSB, “The Diminishing Birth-Rate in the United States,” *Forum*, Vol. 15 (1893), pp. 467-477. See also discussion in Hodgson, “Ideological Currents,” *loc. cit.*, pp. 34-35.

³⁴ Jacob I. Riis to JSB, 6/2/1892, in JSB papers NLM, Box 21.

³⁵ B. to Juan Guiteras, 12/4/1893, JSB, Letterpress book #153, JSB papers NLM, Box 25.

Thus the best that could be done was “to give a number of approximate life tables relating to three or four states and several cities.”³⁶

Some of the communications that flowed onto Billings’s desk were from able newcomers to the ranks of America’s registrars and public health statisticians, all of them avid users of the census findings. Some of these men aspired to scientific leadership in the country’s professional vital statistics work; they were well aware of the gaps that had been opened by the deaths, in the eighties, of such large figures as Jarvis, Snow and Harris. Among the potential aspirants were such health officers as Boston’s Samuel W. Abbott, Providence’s Charles V. Chapin, and Michigan’s Cressy L. Wilbur, along with the actuary Frederick L. Hoffman and the Cornell demographer Walter F. Willcox. By the nineties, all of them had begun to borrow materials from Billings’s library and sometimes to ask his opinion of their work. Most were supporters and sometimes constructive critics of his work. And all were influenced in some way or another by him.

Willcox, like other scholars who wanted to obtain the census’s newly published vital statistics reports, initially wrote Billings for copies. However, since the latter’s office had no role in the sale of census publications, Billings suggested that Willcox write directly to officials at the top who controlled such distributions, to the Superintendent of the Census or even the Secretary of the Interior. “In that way,” he advised, “you are not only sure to obtain what you want, but will give to these gentlemen the idea that there is someone in the United States who wishes these reports and will use them. They receive very few requests for reports on vital statistics in comparison with those which they receive for reports upon other branches of statistical science, and I think it is a good thing that they should occasionally be reminded that there are students in this department also.”³⁷

Through the eighties and early nineties, Billings periodically took time from his census activities to continue his academic lectures at Hopkins, Columbia, the Army Medical School, and Penn. In them, he normally covered the basics of vital statistics registration and health statistics, particularly to his classes of embryo health professionals. In the process, he interested some of them in the further study of statistical methods in preparation for eventually doing public health analyses and research.

³⁶ B. to Walter F. Willcox, 2/21/1894, JSB papers NLM, Box 25, letterpress book #153.

³⁷ *Ibid.*

In another direction, Billings likewise persevered, at least sporadically, as part of the campaign to make public health a central part of medicine, in his efforts to keep physicians informed about the values and methods both of vital statistics and medical statistics. His most ambitious effort along this line was his presentation in 1889 of the Cartwright series of four lectures at the College of Physicians of New York. Rather than aiming them at the trained statistician, Billings intended these lectures to provide moderately well-educated members of the medical profession with an introduction to the uses of statistics in "scientific and practical medicine and sanitation." Noting that both he and the College officials had had "considerable doubt and hesitation" about presenting a topic that was inherently "dry and uninteresting," he nevertheless agreed to go ahead because "the subject is not one which lies within the ordinary range of medical studies, [and because] the data are widely scattered in literature." Moreover, he reminded his readers, they could be useful to anyone. "Statistics are somewhat like old medical journals, or like revolvers in newly opened mining districts. Most men rarely use them, and find it troublesome to preserve them so as to have them easy of access; but when they do want them, they want them badly."³⁸

A few years later, Billings returned to his discussion of medical statistics with a chapter in a general medical text by Thomas Allbutt. His presentation there was at a rather more advanced level than that of the Cartwright lectures. He also gave it added importance by providing a summary and assessment of disease statistics from a handful of censuses, military forces, European varieties of 'friendly societies,' and others. However, he noted the continuing paucity of such statistics and warned that "it is not probable that anything like complete returns of sickness will be obtained in the near future for any large body of the general population."³⁹

Billings's census work as well as his varied other writings on vital and medical statistics brought him into considerable contact with European professionals during the eighties and nineties. He exchanged reports and ideas with such prominent statisticians as Luigi Bodio of Italy, Jacques Bertillon of France, Josef Korosi of Hungary, and Arthur Newsholme of England. And he came to know these individuals personally to some extent at the occasional

³⁸ JSB, "On Vital and Medical Statistics," (The Cartwright Lectures), *Medical Record*, Vol. 36 (1889), pp. 589ff, 617ff, 645ff.

³⁹ JSB, "Medical Statistics," in Thomas C. Allbutt, ed., *A System of Medicine* (New York: Macmillan, 1896), pp. 3-20.

meetings he attended of the various international societies. In 1893 Billings was elected to membership in the International Statistical Institute, one of twelve American members, though he was rarely able to participate.⁴⁰ He was somewhat more active, during the early nineties, as member of the permanent committee of the International Congress of Hygiene and Demography. His main contribution there seems to have been the distribution of information to the other members about American medical and science journals, state and local boards of health, and prominent physicians. In 1891 he alerted one of the British committeemen to the pressure the latter was likely to receive from Americans who were hoping to be named honorary president of one or another of the Congress's sections. "It is well to remember that those who ask are least likely to deserve . . . There are really very few men in this country [The United States] who have actually done much to promote sanitation, but there are many who can talk about it indefinitely."⁴¹

Billings made special efforts to attend the triennial meetings of the International Congress of Medicine, and he spoke at or otherwise participated in several. At Berlin in 1890, addressing the Tenth Congress's section on military medicine, he proposed creation of a committee to recommend a uniform system of sanitary statistics for all armies. Following this, after three years of discussion, the governments of ten countries accepted the proposal, and in 1894 all of them sent delegates to Budapest to the first formal meeting of the permanent Commission on Uniform Military Health Statistics. The meeting agreed, among other things, that statisticians of all participating armies should publish annual statistical summaries of their sanitary condition and should exchange these publications with each other. The delegates then chose Billings to be the Commission's President, with Paul Myrdacz of the Austro-Hungarian empire as Secretary.⁴²

⁴⁰ Among other American members at that time were Francis Walker, Carroll Wright, Davis Dewey, Richard Ely, Edward Atkinson, and Worthington Ford.

⁴¹ B. to W. S. Corfield, 1/7/1891, JSB papers NYPL.

⁴² JSB, "Can the Reports of the Sick and the Sanitary Statements of the Different Armies be arranged According to a Scheme essentially Uniform for the purpose of gaining statistics of scientific worth for Comparison of Diseases, Wounds, and Deaths in Times of Peace and War," *Verhandlungen des X Internationalen Medizinischen Congresses, Berlin, 4-9 August 1890* (Berlin, 1891), Band 5, 18 Abtheilung, pp. 107-134. For details of the Commission's founding, see Paul Myrdacz to JSB and others, 5/25/1895, unpaginated memorandum in French,

On the face of it, the creation of the Commission, particularly since it was to be under the guidance of a statist of Billings's stature, seemed for its members to have been a hopeful development, at least to stimulate if not fully standardize vital data collection within the European community of military sanitary statisticians. However, there were no means of enforcing statistical improvement on members, all of whom represented fully autonomous nations. Likewise, armies by nature often tended to be suspicious or hesitant about sharing any of their internal data with personnel in other armies that might become adversaries at any time. Moreover, for Billings, his separation from the rest of his commission by 3,000 or so miles of ocean was a serious obstacle to effective management of the body.

Still, there were some constructive early activities. In his first year, Billings made certain that the Commission invite other European countries to become members and thereby enlarge the interchange of data and publications. To bypass local bureaucratic printing delays in some of the countries, he also made arrangements for copies of their various tabular summaries to be published regularly in the American Army Medical Department's statistical reports. During the Commission's first few years, moreover, he carried on a lively correspondence with the other members, especially Secretary Myrdacz.

At the same time, however, since Billings received no money from the Army Medical Department for further trips to Europe, he was unable to prevent some waning of the Commission's early enthusiasm and initiatives. In 1895, this decline became more pronounced with Billings's resignation from the United States Army, a step that required him to turn some of his Commission responsibilities over to others, particularly to the Secretary. But Myrdacz lacked both the authority and the professional standing to do anything about reversing the decline. He continued to send Billings news, but little if any of it from that point on showed the organization in a positive light. Myrdacz faithfully attended the body's second triennial meeting in Moscow in 1898, but he wrote that it had been a waste of time. Looking for reasons, he came to the conclusion that, without having Billings available to play an active role, the Commission was no longer in a position to do much of importance.⁴³

in JSB papers NYPL, see folder for International Commission on Uniform Military Health Statistics.

⁴³ P. Myrdacz to JSB, 9/18/1898, JSB papers NYPL, folder for International Commission on Uniform Military Health Statistics. For an account of

Actually, as the century ended, Billings became less concerned with European sanitary statistics than with winding down his activities with the American census. Specifically, at this point, it meant completion of the process of proofreading the huge vital statistics tomes of the 11th census, a task that he shared with King. This was a labor that had by no means ended when he became Director of the New York Public Library in 1896. In fact, the work dragged on for months, but Billings seems never to have even thought of sloughing his share of the duty off onto the ever-reliable King.⁴⁴

Meanwhile, Billings encountered difficulties in carrying out his proof-reading tasks, and these elicited an uncharacteristic complaint about the clerical and other support he was receiving from the Census Office. Writing to Willcox in 1896, he confessed that “the whole of my work in the Census has been done in the face of great obstacles owing to repeated changes of clerks for political reasons, and I am tired of struggling with the most unpropitious circumstances which have surrounded the work.”⁴⁵ Nevertheless, despite his dissatisfactions, he and King persevered in the reading of proofs until the last of them could be sent to the printer.

When the vital statistics reports for the 11th census finally appeared in print, little seemed to remain for Billings to do in this area of activity except to have King named to succeed him in directing the census’s future vital statistics operations. This was accomplished in two stages. In 1897 he gained King a temporary appointment as census clerk for the inter-censal period. And, less than two years later, he was instrumental in having his protegee named director or “chief statistician” for vital statistics for the twelfth census. This was a post that the latter held until his death in 1906.⁴⁶

Billings’s work on the Commission, see Walter F. Willcox, “The Development of Military Sanitary Statistics,” *American Statistical Association, Publications*, Vol. 16 (1918), pp. 917-920. Willcox, writing during World War I, thought that the Commission’s initiatives had been praiseworthy, particularly since the difficulties it had faced were “almost insuperable.” He blamed its failure, inappropriately, I believe, largely on the lack of any international “driving force of public opinion and indignation” such as Florence Nightingale and Sidney Herbert had benefitted from earlier in England.

⁴⁴ William A. King to JSB, 6/17/1897, JSB papers NYPL.

⁴⁵ Quoted in W. F. Willcox to JSB, 5/30/1897, JSB papers NYPL.

⁴⁶ King to JSB, 6/21/1897 and 3/12/1899, JSB papers NYPL. For an appreciation of King’s tenure as Chief Statistician for Vital Statistics, see George H. Van

During the late 1890s, except for occasional correspondence, Billings normally followed the developments of the King era of official vital statistics principally from a distance. Soon after 1900, however, King and the 12th Census's Director, William R. Merriam, sought him out for help in coping with a full-blown crisis. The congressional enabling act for the 12th Census had required that all of the agency's reports be published before July 1, 1902. However, it was quickly evident to the census officials that a large proportion of the vital statistics data that were collected could not possibly be ready by that date. In fact, the essential analysis and interpretation of those data would barely be started by that time, since they depended totally on the receipt in King's division of related data from the agency's population division.

Billings initially protested that he had been away from the census too long to be able to do anything useful except with great difficulty. Eventually, however, he agreed to prepare a short description and analysis of key portions of the material that had had to be omitted. The result was a limited followup of his earlier report on the 1890 census, one that focussed particularly on comparative urban death rates and on selected state life tables.⁴⁷

Before Billings completed this work, the United States government's census operation finally gained new and much-needed status as a permanent federal bureau. When the news reached him, in March 1902, he sent his congratulations to Merriam.⁴⁸ He was also entitled to much personal satisfaction; this was, after all, a development that he himself had sought for over a quarter of a century.

Billings and many of the other late nineteenth century medical advocates of vital statistical improvement were, of course, members of the active wing of the medical regulars. As such, a considerable number of them had become

Buren, "William Alexander King and the Federal Registration System, 1900-1906," *Journal of the American Statistical Association*, n.s., Vol. 21, No. 155, (Sept. 1926), pp. 267-272.

⁴⁷ JSB, *A Discussion of the Vital Statistics of the Twelfth Census* (Washington: GPO, 1904) (U. S. Bureau of the Census, *Bulletin 15*. See particularly North's "Letter of Transmittal," p. 5.

⁴⁸ W. R. Merriam to JSB, 3/10/1902, in JSB papers NYPL. See also Wright, *United States Census*, pp. 79-84; and Anderson, *American Census*, pp. 78-106.

involved in a broad spectrum of other science-related health reforms.⁴⁹ In fact, they had finally begun stirring up the anti-science regulars to an extent that few of the reformers seem to have foreseen.⁵⁰

⁴⁹ Cressy Wilbur, a few years later, vividly paraphrased a popular impression of vital statistics "as the Cinderella of modern public hygiene, sitting in the chimney corner sifting the ashes of dusty figures while the proud sisters, Bacteriology and Preventive Medicine, go to the ball, and talk about the wonderful things they have done." Quoted by William H. Guilfoyle, "Vital Statistics in the Promotion of Public Health," *J. Am. Pub. Health Assoc.*, Vol. 1 (1911), p. 20.

⁵⁰ See discussion in James H. Cassedy, "Registration Area . . . 1885-1915," *loc. cit.*, pp. 221-231.

Chapter 9

Billings in Organized Medicine and Science

The founding of the American Medical Association in 1848 was initially at least a moderately welcome event for most regular physicians. And, during its early decades, the membership displayed enough unity to organize their reforming struggles against irregulars, while attempting also to improve medical education, stimulate better quality medical journals, and encourage individual medical investigation. By the postwar period, however, the membership was beginning to divide over the nature and desirability of the European medical-scientific elements that had begun to be discussed at their meetings. On one side were the followers of those ideas, the relatively small number of well educated and mostly urban physicians who were influenced by leaders such as Billings or who had studied scientific medicine abroad. On the other side, however, a majority of the AMA members were typically less educated, knew little science, and were becoming suspicious of those who promoted science. In fact, they came to believe that the advocates of scientific medicine among them were fully as threatening to their traditional medical practices as the sectarians were.

Physicians in Conflict: The A.M.A. and the Threat of Science

It is unlikely that Billings or many other enthusiasts of scientific medicine before 1880 felt very strongly one way or another about the American Medical Association as a professional body. They certainly never thought of themselves as medical revolutionaries. Moreover, Billings had become one of America's best-known medical men by working with the establishment when appropriate. He went to its meetings fairly often, though, with his friends, he tended to find the Association cumbersome, ineffectively organized, or sometimes simply irrelevant. In the late 1870s he also became a member and then Chair of the A.M.A.'s Section on State Medicine and Public Hygiene,

though he seems to have found the American Public Health Association and its activities more useful for himself than the other body was. At the same time, he recognized the political clout that the A.M.A. could wield, and he took advantage of that influence when it could be marshalled on behalf of the Surgeon General's Library.

Meanwhile, the efforts of Billings and other reformers to bring scientific medicine to the post-Civil War United States initially went forward with little or no reference to the American Medical Association. According to some, this came about because, among other reasons, while AMA meeting programs included some scientific papers, the Association had no official journal that could give the members some guidance to the European medical and scientific literature. While other physicians did not think that this was a good idea at all, the Association did vote for such a journal and set about to organize it.

By the early 1880s, however, the heightened use of foreign medical sources by the reform physicians increasingly appeared as a hostile gesture to many A.M.A. members, particularly those from rural areas of the South and Midwest. Scientific medicine, especially, took on a threatening aspect simply because its ideas and practices differed so much from America's traditional medicine. Accordingly, when the A.M.A. had an opportunity to endorse and encourage science at this time, these conservative segments not only rejected that chance but did so in a way that stirred up an acrimonious dispute, one that badly divided the Association's membership for most of the remainder of the nineteenth century.

In 1883, certain physicians, seemingly seeking to appease both parties, attempted to interest Billings in becoming the first editor of the A.M.A.'s new official journal. Theophilus Parvin of Indianapolis, writing in a midwest journal in an attempt to influence the choice, described Billings as being "peculiarly fitted for this important and responsible position," a respected leader who was "loyal to the American Medical Association, one of its most constant attendants, and one of its best workers," and apparently also a proven mediator. Subsequently, the conservative physician Nathan S. Davis sent an offer under which the other man could have the job virtually on his own terms. However, Billings could not see his way clear to accepting it and instead urged Davis himself to take the editorship.¹

¹ Parvin to the editors, *Louisville Medical News*, (1883), p. 27. Clipping is in JSB scrapbooks (microfilm copy is with JSB papers NLM). Also, JSB to N. S. Davis, 1/25/1883, JSB papers NLM, Box 13.

In 1884, seemingly almost unaware of the sentiments and strength of the anti-science bloc, the current president of the A.M.A., Austin Flint of New York, together with Billings and other pro-science leaders, initiated action that ultimately led to a violent response. They had unilaterally committed the Association to invite the International Medical Congress to hold its 1887 meetings in Washington, D.C. The invitation specified that a committee to be chosen by Billings largely from among well-known scientific professionals in the eastern states would organize and make initial arrangements for the meetings. For these individuals, the meetings offered a unique opportunity to show off the recent advances of medicine in the United States. They thus proceeded to work up what they considered to be an attractive, heavily scientific program. And for it they recruited a panel of outstanding physicians as section heads and speakers, individuals whom Billings regarded as being among America's most productive investigators and contributors to scientific medicine.²

In April 1885, Billings's committee took its plans for the Congress to the A.M.A., then in session in New Orleans. There, with no advance notice, it received a thoroughly hostile reception. Traditionalists, on hearing about the plans of Billings's pro-science group, packed the meeting in protest. And above all, they made it known that the committee members themselves, together with most of the proposed participants were unsuitable. The public reason they gave for this was that many of the latter individuals were members of the State Medical Society of New York, a body that in 1882 had broken with the A.M.A. by adopting a new code of medical ethics, thus making all its members heretics in the eyes of the Association. Their crime consisted in the fact that the new code was deliberately contrary to the A.M.A.'s old code in permitting participating physicians to consult with any legally qualified practitioner, even homeopaths, as was allowed in New York.³

² Studies of the AMA include Morris Fishbein, et. al., *A History of the American Medical Association, 1847 to 1947* (Philadelphia: Saunders, 1947); and James J. Burrow, *AMA: Voice of American Medicine* (Baltimore: Johns Hopkins University Press, 1963).

³ Short accounts of the formation and history of the International Medical Congress of 1887 are A. McGeehee Harvey, *The Association of American Physicians, 1886-1986* (Baltimore: Waverly Press, 1986), pp. 13-19; Toby A. Appel, "Biological and Medical Societies and the Founding of the American Physiological Society," in Gerald L. Geison, *Physiology in the American Context*,

Armed with this and other fabricated justifications, sympathetic local A.M.A. officials at New Orleans dissolved the Billings committee and appointed a new committee that went ahead to select a sanitized list of participants for the Congress. In turn, Billings and all of the other original founders and committee members except Flint promptly resigned, touching off a nationwide wave of sympathy by their supporters. Within the next few months, not only the rejected participants but representatives of America's new medical specialty associations and other scientifically minded physicians, distanced themselves from a Congress that was now to be organized and run by the anti-science majority of the A.M.A.⁴ Typical of the more temperate responses was that of George Sternberg, who declined the invitation of the new organization committee to be vice-president of the Congress's pathology section: "I was very well pleased to be a member of this Section under the first organization [that of Billings], but under present circumstances think it more creditable to be outside of the ring."⁵

Facing the likelihood of the Congress's total failure, some A.M.A. moderates searched for means of restoring its appeal and integrity. Among other steps, they attempted to have Billings named to the new committee on arrangements or some other post, perhaps even the Presidency of the Congress. However, Billings, still offended by the way he had been treated, was unwilling to make any such accommodations. He swore that he "could not accept an official position of honor while some of my friends were disgraced by being turned out." Moreover, as the time for the Congress came closer, it appeared to him that "the great majority of the leading physicians of America will have nothing to do with it. There has not been the least attempt towards a compromise—in fact, the trouble is one that does not admit of any compromise. The Congress is under the control of a set of demagogues

1850-1940 (Bethesda, Md: American Physiological Society, 1987), pp. 158-163; and Lester S. King, *Transformations in American Medicine* (Baltimore: Johns Hopkins University Press, 1991), pp. 212-214.

⁴ For a pertinent examination of this period's medical ethics issues and conflicts, see John Harley Warner, "Ideals of Science and their Discontents in Late Nineteenth-Century American Medicine," *Isis*, Vol. 82, No. 313 (1991). See also Robert B. Baker, et. al., ed., *The American Medical Ethics Revolution: How the A.M.A.'s code of Ethics has Transformed Physicians' Relationships to Patients, Professionals, and Society* (Baltimore: Johns Hopkins University Press, 1999).

⁵ Sternberg to JSB, 6/3/1886, JSB papers NYPL.

and medical politicians who have no scientific standing, and the best men in Europe will refuse to endorse them by attending the Congress.”⁶

At this same point in time, in 1886, Billings himself contributed to the general rancor and polarization with an address that he presented in Brighton, England. His largely statistical address was possibly intended simply to inform the British physicians of the different levels of medical and public health practice then existing in the respective geographic regions of the United States. And if that was all Billings had in mind, he was less politically-minded than he was usually considered to be. In any case, he could have hardly done more to stir things up than to emphasize, as he did, the high disease incidence and undeveloped medical status of western and southern small towns and rural areas, in contrast to the relatively favorable health and medical status of the northeast and other more populated areas. Whatever Billings had in mind, the address may well have lessened some of the European interest in the Congress, while, when the text reached the United States, it further inflamed some of the southern and western traditionalists.⁷

Eventually, Billings came to realize that he had to be careful to avoid any appearance of actively working for the failure of the Congress. To friends, he confided his fear that his opponents, if given the slightest of pretexts, might well retaliate by attempting to weaken or destroy the Army medical museum and library. “My position as a government official in this matter is a delicate and difficult one, for I do not wish to injure the interests of the scientific work of our Bureau.”⁸ His solution was thus to avoid publicity and keep as low a profile as possible. Yet, though he had relinquished his leadership roles, he declared that he remained available to work with the new organizers for the success of the Congress, stating that now “I am simply a high private and mean to stay so, but in that capacity I will do what I can.”⁹

The Ninth International Medical Congress did meet in Washington between September 5 and 10, 1887, under the presidency of Nathan S.

⁶ JSB to Jerome Cochran, 4/21/1886, JSB papers NLM.

⁷ JSB to W. H. Doree, 12/6/1886, JSB papers NLM. For Billings's Brighton address, see John Shaw Billings, “Medicine in the United States, and its Relation to Cooperative Investigation,” *British Med. J.*, Vol. 2 (1886), pp. 299-306. See also comments in Garrison, *Billings*, pp. 252-262.

⁸ *Ibid.*

⁹ JSB to A. B. Palmer, 5/29/1886, JSB papers NLM. See also JSB to Jerome Cochran, 4/21/1886, JSB papers NLM; and Garrison, *Billings*, pp. 260-262.

Davis, by then the editor of the A.M.A.'s journal, and with Billings's rival, John B. Hamilton, as Secretary-General. The new A.M.A. committees had rounded up over 2,500 attendees, but Billings wrote his out-of-town friends that there were almost no big names or distinguished scientists and only a handful of foreign delegates. Meanwhile, the scientific level of the papers presented at the sessions was reported in the probably partial medical press to have been mediocre if not abysmally low.¹⁰ Afterwards, one of Billings's friends expressed a certain wry pleasure, apparently common to many other individuals, that he had not had to attend or participate in what he considered to have been an embarrassingly poor quality event, "A Congress chiefly remarkable by the absence of the leading men of the country in which it is held was unique to say the least—not only unique but eunuch, i.e. emasculated."¹¹

For the historian, the episode of the Congress reveals Billings at his most complex and human, and sometimes his least attractive. On the one hand he was often demanding and dictatorial. At the same time, convinced of his rightness, he refused to compromise when his medical beliefs and those of his elitist faction were at stake. Sometimes he proved to be a poor loser. Above all, perhaps, he was bitterly frustrated to have been bested, professionally and politically, for a second-time in a decade by his Marine Hospital Service rival, Hamilton, and to be forced for a time into a position where he was not in control of his own destiny. Nevertheless, after a surprisingly short period as a loser, he emerged once again as a winner. In fact, before the Congress was even completed, he was leading America's pro-science movement in a new direction and with new organizational structures, this time outside the AMA, and with his close colleagues providing the manpower.

There is no doubt that the Congress episode left Billings with a bad taste in his mouth. Over the next ten years or so, he almost totally dissociated himself from the A.M.A. Even when some of his friends became presidents or committee chairmen of the Association, they were unable until soon after 1900 to persuade him to resume any role in it. Only then did the anti-science sentiment in the Association give way to a tolerant attitude with which he could be comfortable.¹²

¹⁰ See summary in Appel, "Biological and Medical Societies," *loc. cit.*, pp. 158-162.

¹¹ Stuart Eldridge to JSB, 10/17/1887, JSB papers NLM, Box 18.

¹² See Burrow, *AMA*, *passim*.

This is not to say that he gave up his objectives on behalf of scientific medicine during those late nineteenth century decades. On the contrary, his split from the American Medical Association was accompanied almost immediately by creation of a set of allegiances with newly established professional societies that were explicitly devoted to science in medicine. In fact, even before the International Congress took place, he began to encourage such societies in both practical and symbolic ways: he became a member of several of them, and then invited them to hold their meetings in the hall of the Medical Museum and Library. Additionally, as with the meetings of The American Surgical Association in 1886 and other societies, he served as chairman of arrangements and sometimes delivered a paper. Moreover, the Congress of American Physicians and Surgeons, organized as an umbrella body for the specialty societies, not only held its initial meetings in 1887 at the Army Medical Department's facilities but elected Billings as its first president.¹³

The Surgeon General's Office had periodically hosted such meetings over the years. But the fact that it did so now, in the midst of and shortly after the controversies of the mid-1880s, served to demonstrate Billings's and the Office's unflagging support of scientific medicine. That position was particularly underscored by their invitation to the new Association of American Physicians to hold its first regular meeting at the Army's Washington facilities. The Association was a limited membership organization, one that grew directly from some of the small meetings of science-oriented physicians that were held around the United States in 1885 to protest the A.M.A.'s rejection of the Billings committee and its choices for the Congress. It was thus no matter of chance that a very large proportion of its members and participants at this first meeting in 1886 were individuals who only a few months earlier had been on Billings's slate of committee nominees.¹⁴ Billings himself became one of the Association's original members.

The thriving of this society together with the medical specialty associations during the 1880s and '90s of course constituted only a limited step toward scientific medicine. The moves of Billings and other advocates to

¹³ See Appel, "Biological and Medical Societies," *loc. cit.*, pp. 158-162.

¹⁴ Prominent among the many individuals who provided such continuity were Francis Delafield, S. Weir Mitchell, F. Peyre Porcher, W. T. Councilman, Reginald Fitz, William Welch, and William Osler. See various lists in Harvey, *Association of American Physicians*, chapters 1 and 2.

extend science throughout mainline medical thinking and practice continued to be delayed by the hostility of A.M.A. traditionalists. However, the specialty associations rapidly provided themselves with congenial environments for the thorough discussion of scientific matters. A prominent reason for this was that their members were increasingly well informed and potent in those discussions, at least partly because they were among the most regular and frequent users of the Surgeon General's Library and its finding catalogs. Moreover, with this access to the literature that was being generated by the medical revolution abroad and at home, the society members themselves became increasingly able to contribute to the period's flood of knowledge. As such, they became effective participants in the effort to undermine the A.M.A. traditionalists and other pockets of medical 'know-nothingism'.

Beginning in 1893, Billings and other leaders of scientific medicine participated in an ambitious research program sponsored by yet another new organization, the ad hoc national Committee of Fifty to Investigate the Liquor Problem. Billings himself was one of the organizers of this Committee, and, with Seth Low, Charles W. Eliot, Carroll Wright, and other educators and scientists, served on its executive committee. At the outset, the central body divided into four research units that were to focus respectively on the economic, legislative, ethical, and physiological aspects of the problem; Billings became chairman of the physiological sub-committee. In this capacity, he hand-picked the rest of the sub-committee—Henry P. Bowditch, Wilbur O. Atwater, Russell H. Chittenden, William H. Welch, G. Alder Blumer, and Francis A. Walker—and with them developed an agenda.

Over the next ten years, as they could fit them in, the members worked on their individual studies. Some of these were laboratory researches on the relations of various alcoholic beverages to specific diseases, while the others were principally statistical in nature. Billings himself at the beginning contributed a bibliography of the pertinent literature and then conducted two original statistical investigations. One of these summarized the results of a survey on the use of alcoholic drinks among about six hundred educators, businessmen, scientists, and other professionals. The other, a study of the relations of drinking to insanity, presented the findings of a questionnaire that had been sent to 117 mental hospitals through the cooperation of the American Medical-Psychological Association.¹⁵

¹⁵ For details of the sub-committee's work, see John Shaw Billings, ed., *Physiological Aspects of the Liquor Problem*, 2 vols (Boston: Houghton, Mifflin,

When the sometimes lengthy reports of the various experts had been finished, Billings pulled them together, added a short history of the Sub-Committee's proceedings, and made arrangements for their publication as a book in 1903. Since no provision had been made for vetting the individual reports, the book as a whole proved uneven in quality, and parts were controversial. The methods and conclusions of Atwater, who insisted on viewing alcohol as a food rather than a poison, provoked particular criticism, including some by other American Physiological Society members as well as by A.M.A. members. Billings, however, seems to have been consistently supportive of the Atwater position.¹⁶

A Physician in the Washington Scientific Community

While Billings's career-long commitment as a physician to bring about a scientifically based medicine sometimes involved him in violent professional controversy, his equally long pursuit of interests in science as such and involvement with groups of scientists most of whom were not physicians, played itself out relatively peaceably. The latter connections often grew essentially out of personal intellectual curiosity and usually had little or nothing to do with his professional status or future in medicine. At the same time, he took them so seriously and brought so many talents to them that he achieved respect as a scientist himself along with leadership in a variety of science groups both local and national. In large part this standing grew out of the major support afforded him by individuals and institutions of the Washington scientific community.¹⁷

1903). Billings's two reports are in Volume I, pp. 307-335. Much of his extensive correspondence with professionals, hospitals, and others pertaining to those reports is included in his letter press notebook on the Committee of Fifty for January-June 1895, JSB papers NLM, Box 25. See also JSB, ed., *Bibliography (Preliminary) of the Literature on the Physiological and Pathological Effects of Alcohol and Alcoholic Drinks* (Washington: Judd & Detweiler, 1894).

¹⁶ The ramifications of this controversy have been interestingly discussed by Jonathan Zimmerman, "'When the Doctors Disagree': Scientific Temperance and Scientific Authority, 1891-1906," *J. Hist. Med. & Allied Scis.*, Vol. 48 (April 1993), pp. 171-197.

¹⁷ Various histories examine this community and/or portions of its background. For the larger setting, see two now-classic works, Constance McLaughlin

At the time Billings went to live in Washington, the relatively skimpy professional medical life of the capital city contrasted conspicuously with the richness of the life of learning and science. The three main academic institutions in the area, Georgetown University, Columbian (later renamed George Washington) University, and the nearby Naval Academy at Annapolis all maintained science departments. But many of the most impressive scientifically related institutions, activities, and contributors were in the federal government. In the mid-1860s, in addition to the Army Surgeon General's Office and Army Engineers, these included the Library of Congress, the Coast Survey, the Naval Observatory, the Smithsonian Institution, the National Academy of Sciences, a cluster of western exploration projects and geological surveys, and other agencies or enterprises.¹⁸

Soon after he joined the Surgeon-General's Office, Billings's work activities and interests began affording him contacts with individual scientists at some of these institutions. Since the older generation of Washington's scientific leaders was dying off by the mid-'60s, many of his initial scientific acquaintances in the community proved to be forceful and brilliant newcomers like himself. Often these were still youngish veterans of the war who were now driven by peacetime ambitions in one or another federal agency, men such as the astronomers Simon Newcomb and Edward Holden, the mathematician Benjamin Peirce, and the geologist-anthropologist John Wesley Powell, and if they met nowhere else regularly, they at least

Green, *Washington: A History of the Capital, 1800-1950*, 2 vols. (Princeton: Princeton University Press, 1962), Vol. I, pp. 291-400); and A. Hunter Dupree, *Science in the Federal Government, A History of Policies and Activities to 1940* (Cambridge, Mass.: Belknap Press of Harvard University Press, 1957), pp. 149-301. Two other interesting and well-written works deal with the community in considerable detail, but neither has recognized or discussed in any detail the significant roles played by Billings or the Surgeon General's Office in it: James K. Flack, *Desideratum in Washington: The Intellectual Community in the Capital City, 1870-1900* (Cambridge, Mass.: Schenckman, 1975); and Michael J. Lacey, "The World of the Bureaus: Government and the Positivist Project in the Late Nineteenth Century," in Michael J. Lacey and Mary O. Furner, ed., *The State and Social Investigation in Britain and the United States* (Washington: Woodrow Wilson Center Press and Cambridge University Press, 1993), pp. 127-170.

¹⁸ Dupree, *Science in the Federal Government*, *passim*.

occasionally found themselves together at special scientific or academic events.

Through those early years, however, some of Billings's most frequent scientific contacts were with established scientific leaders at the Smithsonian Institution and the United States National Museum. He occasionally lectured at those institutions and served on their committees. He had useful connections with the Smithsonian's administrator and future historian George Goode. And above all, he and others at the Surgeon-General's Office cultivated the naturalist Spencer Baird, first at the National Museum and later as the Smithsonian's Secretary. In the mid-1860s, for instance, Billings sometimes went out of his way to accommodate Baird by finding western jobs as contract surgeons for unemployed physicians who were interested in natural history collecting. In subsequent years, the two men worked out other arrangements that were beneficial to both institutions, among them, occasional exchanges of books as well as provisions for distributing the Smithsonian's natural history circulars in the periodic shipments of materials that the Surgeon General's Office sent out to army surgeons in the field. Not least, after Billings became curator of the medical museum, he continued with Baird and his successors the occasional exchanges of skulls and other specimens that had been started in earlier decades.¹⁹

During the time that Billings's own diverse Washington career was unfolding, it was Baird more than any of the other leading Washington scientists with whom he had consistently close affinity. Baird's basic work activities as a collector and classifier by themselves made him a kindred spirit for the newer man. However, as an administrator he became even more of a role model, particularly with his superior "capacity for managing men and for organization" but also with his unfailing "modesty and usefulness." At other times, in his capacity as a fellow federal science official, Baird earned Billings's special admiration for his ability to defend his programs in Congress and win the confidence of Congressional committees. This was not only because of his total command of his subject but through his "simple manner, evident honesty, . . . and perfect readiness to answer all

¹⁹ See, for example, Baird to JSB, 4/28/1866 and 7/5/1866, both in JSB papers NLM, Box 26; also, JSB to J. A. Finley, 1/30/1884; and JSB to Baird, 1/31/1884, both in JSB papers NLM, Box 14. For a history of the Smithsonian during this period, see George B. Goode, ed., *The Smithsonian Institution, 1846-1896* (Washington, D.C.: Smithsonian Institution, 1897).

questions.” Finally, as a workaholic who was never known to shirk from enormous routine labors, Baird gained not only Billings’s approbation but his instinctive understanding.²⁰

Another important influence at the Smithsonian was that of its first Secretary, Joseph Henry. Although Billings served with him between 1876 and 1878 on the Capitol Ventilation Board, Henry was by then near the end of his career and had mainly his personal prestige to contribute to the Board’s work. Of far greater significance for Billings was Henry’s initiative earlier that same decade in the formation of the Philosophical Society of Washington, the capital’s first substantial scientific association.

In 1870, Henry began working on a project to create a thoroughly professional “association of a strictly scientific character,” one whose members would be mainly chosen on the basis of their investigative experience and “positive contributions to science.” He warned against allowing “amateurs and politicians” to control such a society, and he insisted that learned papers presented in it should be “subject to free critical discussion.”²¹ The Philosophical Society of Washington was subsequently organized in accordance with these principles, held its first meeting in March 1871, and chose Henry as its President. The forty-three founding members who convened the meeting represented virtually all of Washington’s science-related institutions. For them and their associates there was at last a central unifying focus, one that the organization continued to provide for the next several decades. At the same time, with a large proportion of its membership being drawn from federal departments, bureaus, and agencies, the society from its beginning had the authentic outlook of a national science society and largely dealt with scientific problems that were national in scope.

The Surgeon General’s Office was involved in the Society from the beginning, furnishing five of the founding members, though only two of them, Woodward and Billings, went on to perform significant professional and scientific services in it on a continuing basis. Woodward became one of the most frequent contributors of scientific communications at the early

²⁰ JSB, “Biographical Memoir of Spencer Fullerton Baird,” National Academy of Sciences, *Biographical Memoirs*, Vol. 3 (1895), pp. 141-160.

²¹ Joseph Henry, “Anniversary Address of the President of the Philosophical Society of Washington,” *Bulletin of the Philosophical Society of Washington*, [Vol. I] (1874), pp. v-xiv.

meetings. He also played important roles on various committees, was one of Henry's eulogists in 1878, and in 1881 became President.

Billings himself was elected to the Presidency in 1885 even though he appeared to have had no committee appointments during the Society's first decade. However, he had more than made up for that lack by the frequency of his participation in the discussions of the scholarly papers. Beyond that, he frequently took advantage of the society's scholarly programs to try out versions of his own research papers and provide reports on the status of his scientific institutions, contributions which usually gave the members glimpses of cutting edge developments in some of the period's medical sciences. Among these were papers on the buildup and features of the Surgeon General's Library, on Billings's researches on ventilation and its relation to health and disease, on the mortality statistics of the tenth census, the scientific work of the National Board of Health, and his modernization plans for the medical museum. One of the most timely was his 1877 paper on "Bacteria and Spontaneous Generation," a report on his recent examination, perhaps in Edinburgh, of the unpublished results of a number of Joseph Lister's latest experiments, and including a demonstration of the latter's apparatus for "excluding these organisms from wounds." These innovations and those of other investigators, Billings informed his hearers, left no further room to doubt "that the so-called doctrine of spontaneous generation is incorrect."²²

For most of the 1870s and '80s, the Philosophical Society held its biweekly meetings at the Ford's Theatre facilities of the Medical Museum and Surgeon General's Library. It was an arrangement which helped to keep the officers of the Surgeon General's staff identified with the programs and objectives of the Washington's late nineteenth century scientific community. As it happened, there was no dearth of stimulating papers during this time, and some were of exceptional interest. Among those was the occasion in 1877 when wires were strung ahead of time around the museum rooms to allow Alexander Graham Bell to demonstrate his telephone to the society members

²² JSB, "Bacteria and Spontaneous Generation," (Abstract), *Bulletin of the Philosophical Society of Washington*, Vol. 2 (1874-1878), pp. 109-110. I have the impression that Billings went out of his way to avoid direct competition with Woodward over the governance of this and other professional organizations in which both men were active. However, I have found no specific evidence to support that supposition.

in one of its earliest public trials.²³ But many members considered almost every meeting to be a productive learning occasion, particularly since there were so many of the nation's scientific leaders consistently in attendance to hear and learn from.

To be sure, Ford's Theatre was not an ideal place for these meetings, since a certain amount of clutter and crowding had to be put up with. However, many of the members developed a certain fondness for it. Billings himself could describe the ambiance better than anyone: "... the entrance up the narrow stairs, often pervaded with a scientific odor from the laboratory on the lower floor—an odor once compared to that of the deluge at low tide—the devious and complicated route from the head of the stairs, past the General Committee room, to the place of meeting." And, for him and others, a memorable segment of the early meetings was the simple ritual that Joseph Henry observed during the '70s when he presided, that is, his "custom of taking a five minutes' dip into one of the volumes of Transactions of the Royal Society, which occupied the shelves behind and on the right of his chair, by way of refreshment before calling the Society to order."²⁴

Virtually from the Society's beginning, some members, thinking that there should also be some less austere type of refreshment, formed the habit, following the formal scientific meetings, of adjourning to a saloon around the corner on D street for beer, oysters, and relaxed male conversation. Prominent among such members were scientists who had studied in Europe and were "fresh from the kellers of Heidelberg or Stuttgart." I have not found any evidence that Billings was a regular member of that group, but he may well have joined it occasionally. He did, in any case, agree fully with a larger nucleus of the membership that began to complain that "there were no collateral attractions" on the society's programs to which ladies might be invited and no facilities of any kind for entertaining guests. It seemed anachronistic in Gilded Age Washington that scientists still had no place where they could socialize with each other and with their friends in some of the ways that businessmen, intellectuals, politicians, and other groups were doing in their clubs. Moreover, in the opinion of Billings and other

²³ Richard T. Loomis, "The Telephone Comes to Washington: George C. Maynard, 1839-1919," *Washington History*, Vol. 12, no. 2 (2000-2001), pp. 23-25.

²⁴ JSB, Response to the toast, "Our Four Hundredth Meeting," *Bulletin of the Philosophical Society of Washington*, Vol. 12 (1892-1894), pp. 549-550.

Society members who frequently stayed at clubs in other cities during their work travels, the Washington scientific community really had an obligation to provide comparable lodgings and dining facilities for their out of town professional visitors.²⁵

In late 1878, such an organization, the Cosmos Club, was formed. Deferring the provision of guest facilities for the moment, the Club started out in modest temporary quarters. There the founders worked to create a body that would be warm in tone, alive, and at all costs avoiding the stuffy and decorous solemnity so often encountered in Victorian clubs on both sides of the Atlantic. At the same time, literary figures and other intellectuals were made eligible for membership alongside the scientists.²⁶

Billings was not only a founder of the Cosmos Club and one of its energetic core of organizers but one who played an active leadership role through its early years. The membership made him their first treasurer, put him on the Board of Trustees, and in 1885 chose him as Vice President. Between 1886 and 1888 he served two terms as President.

During the latter period, in addition to the usual duties of the Presidency, Billings assumed the demanding task of supervising the long delayed acquisition of the club's own building and its alteration to provide for guest accommodations. The structure that was selected, the former Dolley Madison house on Lafayette Square, was a costly one, but the members considered the expenditure well worthwhile. With their support, Billings could move aggressively ahead with the project, completing it before the end of 1886.²⁷

The Cosmos Club now became an attractive and convenient place for Billings and the other members to hold their business dinners in, as well as

²⁵ The quotations are from C. E. Dutton, "Address," in William A. DeCaindry, et. al., ed., *The Twenty-Fifth Anniversary of the Founding of the Cosmos Club of Washington, D.C.* (Washington, D.C.: The Cosmos Club, 1904), pp. 26-27. See also other portions of that volume, especially pp. 1-155.

²⁶ Among the intellectuals who became founders of the club were the historian Henry Adams and the sociologist Lester Ward. However I have found no evidence that Billings had more than incidental connections with either man.

²⁷ These and numerous other details of the club's history during the Billings years are supplied in the 25th anniversary volume, *Ibid.*, especially pp. 89-149. Much less valuable for that period is Wilcomb E. Washburn, *The Cosmos Club of Washington: A Centennial History, 1878-1978* (Washington, D.C.: The Cosmos Club, 1978). However, see also the Billings papers at NLM.

for their out-of-town scientific peers and other professionals to stay in while they were in the capital. At the same time it became the site for the scientific meetings of the Philosophical Society of Washington together with those of the Anthropological, Biological, and Chemical societies, as well as those to be created later for other individual sciences. With this combination of social and scientific functions, the Club thus brought a tangible new dimension to the life of science in Washington, both in its local and its national phases.

Billings in The National Academy of Sciences

Apart from his active roles in Washington's scientific life, Billings's creative national decade of the 1870s had given him a far-flung reputation in scientific circles. In 1882, that recognition brought him nomination to membership in America's most prestigious scientific body, the National Academy of Sciences, and to his election the following year. Chosen at the same meeting were the inventor Alexander Graham Bell, the zoologist William K. Brooks, and the mathematician Thomas Craig. Billings had six sponsors, individuals who were eminent in as many different fields: John Wesley Powell in geology and anthropology, William H. Brewer in agricultural science, Benjamin Silliman, Jr. in chemistry, John H. Crane in mathematics, Theodore Gill in zoology, and Simon Newcomb in astronomy.

Billings came up for membership at a time when the Academy was expanding its membership to better reflect the new fields of scientific interest or concentration identified during the nineteenth century. By the 1880s, therefore, he could be selected for such things as his promotion of scientific thinking in this country, his contributions to the planning and administration of science, and his creation of practical systems for the dissemination of medical and scientific information. More specifically, his candidacy rested heavily on the Academy's acknowledgment of the unique importance of two of his institutions that were still in progress, the Surgeon-General's Library and the Johns Hopkins Hospital. An equally influential factor, moreover, was the fact that the members already knew Billings and his merits extremely well through their monitoring of the work of the short-lived National Board of Health for the United States Congress.²⁸ When they began to consider

²⁸ The active part of the monitoring process was carried out by a special Academy committee chaired by Billings's close friend, S. Weir Mitchell, but its findings were reviewed and voted on by the entire membership. See the "official" history

him for membership in 1882, of course, they were well aware that the Board had by then essentially failed. However, they were in full agreement that the failure had been through no fault or deficiency on Billings's part. On the contrary, it was agreed that he had displayed outstanding qualities as an organizer and manager of a large science-related enterprise.²⁹

Once selected, Billings became a productive member of the Academy. He accepted more than his share of administrative labors, serving occasionally on committees, as the Academy's treasurer between 1887 and 1898, and as one of its Council members between 1896 and 1907. He also, over the years, wrote the memoirs of a few of his deceased fellow members. Of these, he gave Joseph J. Woodward rather perfunctory treatment and Francis Walker only slightly more extended coverage but accorded Spencer Baird a highly original and personal scientific appreciation of considerable depth. In addition, Billings sometimes presented scientific reports at the Academy meetings, particularly papers that summarized the results of recent research carried out under his supervision by his associates or students. These included studies of the use of composite photography in craniology by Washington Matthews; analyses of human bones in one of the medical museum's collections by Matthews and J. L. Wortman; and an investigation of the influence of light upon the bacillus of typhoid and the colon bacillus by Adelaide W. Peckham.³⁰ Along with those he sometimes sponsored the presentations of other junior scientists before the Academy. One of these was M.I.T.'s William T. Sedgwick, who demonstrated his Aerobioscope, a

of the Academy, Rexmond C. Cochrane, *The National Academy of Sciences: The First Hundred Years, 1863-1963* (Washington: National Academy of Sciences, 1978), pp. 136-137.

²⁹ For the Academy's early years, see *Ibid.*, passim. For another commentary on Billings's connections with the Academy, see Chapman, *Order Out of Chaos*, pp. 319-321. For the Academy's relationships with the National Board of Health, see my chapter 4; J. L. Cabell, "Annual Address," *Public Health Papers and Reports of the American Public Health Association*, Vol. V (1879), pp. 1-23, passim; and JSB, "The National Board of Health and National Quarantine," *Transactions of the American Medical Association*, Vol. 31 (1880), pp. 435-455, passim.

³⁰ These works are listed with some additional details in Frank Bradway Rogers, comp., *Selected Papers of John Shaw Billings* (Baltimore: Waverly Press for the Medical Library Association, 1965), pp. 291, 295, and 296-297.

new device for "the biological examination of air." Billings ordered several of the devices for the medical museum.³¹

In 1884, only a few months after Billings became a member, the Academy received a request for professional advice from Congress's newly formed Allison Commission. Specifically, the Commission members desired expert opinion that would bear on potential legislation to obtain better congressional coordination and control of four of the government's largest scientific bureaus, each of which at the time had considerable autonomy: the Signal Service, the Geological Survey, the Coast and Geodetic Survey, and the Hydrographic Office of the Navy Department. First of all, an Academy committee under General Montgomery Meigs conducted a study of the subject and then submitted its report to the entire membership in September 1884. The bulk of the committee's recommendations, including those urging some consolidation of the work of the bureaus, seem to have elicited little discussion. However, the report's proposal to place all of the bureaus together administratively in the same cabinet department, perhaps as a new department of science, brought out considerable difference of opinion. Ultimately the Academy accepted the report and sent it on to the Allison Commission. However, the issues had been so controversial that for the first time in the Academy's history the vote for acceptance of one of its reports was neither unanimous nor harmonious. Billings and several others voted against it, while Alexander Agassiz resigned in protest.³²

The Allison Commission continued to discuss these and other issues, but it went out of existence before its members could reach a decisive legislative solution. However, for the rest of the nineteenth century and beyond, the issues that the Commission had raised, particularly that of a federal science department, remained of great concern to Congress as well as to America's scientific community. No one in the latter community was more concerned or considered the ramifications of the issues more fully than Billings.

In late 1886, reflecting on his forthcoming presidential address to the Philosophical Society of Washington, Billings decided that the occasion

³¹ Sedgwick to JSB, 4/4/1888 and 4/25/1888, both in JSB papers NYPL.

³² I have drawn this paragraph on the Allison Commission largely from two excellent sources: Dupree, *Science in the Federal Government*, pp. 215-231; and David H. Guston, "Congressmen and Scientists in the Making of Science Policy: The Allison Commission, 1884-1886," *Minerva*, Vol. 32, no. 1(Spring, 1994), pp. 25-52.

would be an ideal one for explaining in detail his position on the Allison Commission issues. The immediate audience was appropriate since so many members of the Society, as administrators or investigators in federal science bureaus or departments, had vital stakes in either the immediate or the future outcome of the debates. At the same time, he clearly felt that other audiences as well—legislators and journalists above all but also the public—needed to be educated both in the nature of science and in government-science relations if they were to intelligently shape “the present condition and future prospects of science in this country.” Accordingly, Billings prefaced his address with a discussion of the different kinds of scientists and what each type did, especially contrasting the “pure” scientist from those who seek “information that may be useful,” but showing how each was valuable in society. Improved understanding of such basic details was necessary, he felt, if the national dialog over the Allison Commission issues were to gain in force and precision, with all discussants using the terms properly and not talking at cross purposes.³³

As the heart of his address, Billings then launched an examination and defense of scientists in the late nineteenth century federal government and of the ways they were used, especially in the Army and Navy. With the majority of the Allison Commission, Billings agreed that government science was “on the whole, being well done, and that the people are getting the worth of their money.” However, he questioned current proposals to turn the planning work of the science bureaus over to “disinterested scientific men—as, for instance [to] a committee of the National Academy [on the assumption] that the function of the bureau official should be executive only.” And he vigorously defended a government practice from which he himself had benefited, asserting “that when permanent Government employees have at times not enough to do in their own departments, and can be usefully employed in scientific work, it is quite legitimate and proper to thus make use of them.” Most important, however, he stressed that he was “not inclined at present to urge the creation of a department of science as an independent department of the Government having at its head a Cabinet officer. Whether such an organization may become expedient in the future seems to me doubtful; but at all events I think the time has not yet come for it.”³⁴

³³ JSB, “Scientific Men and Their Duties,” reprinted from *Bulletin of the Philosophical Society of Washington*, Vol. 9 (1886-1887), pp. xxxv-lvi; also in Rogers, *Selected Papers of JSB*, pp. 170-176.

³⁴ *Ibid.*, pp. 177-185.

Billings closed his address to the Washington science community on a cautionary note, rising above any bitterness that he may have harbored from setbacks that he had experienced in his pursuit of science, particularly those related to the National Board of Health and to the International Medical Congress. "We live in a fortunate time and place; in the early manhood of a mighty nation, and in its capital city, which every year makes more beautiful, and richer in the treasures of science, literature, and art which all the keels of the sea and the iron roads of the land are bringing to it . . . Yet we may not rest and eat lotus; we may not devote our lives to our own pleasure, even though it be pleasure derived from scientific investigation. No man lives for himself alone; the scientific man should do so least of all. There never was a time when the world had more need of him, and there never was a time when more care was needful lest his torch should prove a firebrand and destroy more than it illuminates."³⁵

Continuities at the End of an Age

The formal termination of Billings's mutually advantageous and extraordinarily fruitful thirty years of work as a federal scientist in and for the Surgeon General's Office came about in September of 1895, when he resigned from the Army. Prominent among the farewells, there was a reception for him and his wife at the Sternberg home. And, on October 1st, they made their long-planned move from Washington to Philadelphia.

As things turned out, however, despite the several years of preparing for it, Billings never went beyond the beginnings of a new career in Philadelphia. In December, 1895, within weeks after his move to the city, he abruptly revealed that he had been invited to become director of the recently created New York Public Library and wanted to terminate his connections with the University of Pennsylvania.³⁶ After much discussion, some of it acrimonious, the university trustees and administrative officials reluctantly agreed to his release, a process that concluded in June. In turn, Provost William Pepper

³⁵ *Ibid.*, p. 186.

³⁶ A comprehensive and otherwise admirable history of the early years of the New York Public Library is Phyllis Dain, *The New York Public Library: A History of its Founding and Early Years* (New York: The Library, 1972). For other accounts of Billings's appointment, see Chapman, *Order Out of Chaos*, pp. 272-274; and Garrison, *Billings*, pp. 281-282.

and the health professionals at the university were left to try to understand Billings's reasons for withdrawing so unexpectedly from the carefully planned arrangements that some of them had a stake in. In addition, they wondered at the seeming casualness with which he was terminating his lifetime dedication to the advancement of scientific medicine in the United States.

Billings publicly explained little about his decision beyond the statement that he was leaving because he had already accomplished what he had set out to do at the University of Pennsylvania. He added, however, that the New York position offered a considerably larger opportunity to "contribute to the public good" than the one in Philadelphia did. Moreover, it would allow him to take advantage of his experience with the Surgeon General's Library and to build upon it in a large way.³⁷

In addition, certain undoubted factors in Billings's decision to move do not seem to have been made explicit. Among them, during his years with the Army, as well as initially with Penn, he had received and thoroughly welcomed having one major medical challenge after another to work on. But he could not foresee the continuation of many such challenges if he remained at Penn. Moreover, the pattern of his professional exchanges during the Pennsylvania period suggests that Billings had come to realize that the highly successful first stage in America's medical-scientific revolution—the demanding and creative introductory period—was coming to a close, thus making a move to a new field more attractive.

Members of the medical and public health professions who in 1895 paused to look back at the revolution as it had developed so far were reminded how much Billings had influenced it as well as supported them during those thirty years. They recalled particularly, in some cases, the incredibly forceful personal drive and implacable continuity of purpose that he had been able to sustain in his pursuit of their mutual career aims and projects and which had rubbed off on many of those who came into contact with him. And, looking around the American scene, they appear to have been little surprised at the range of major Billings projects that continued as active influences or were just coming to fruition even as he withdrew from his medical-public health career. I will mention only a few.

The Surgeon-General's Library in Washington, of course, was constantly growing: becoming more and more the national medical library, expanding its collections, and obtaining more and more satisfied users. Meanwhile, the

³⁷ Quoted in *Ibid.*, p. 281.

volumes of the great subject guide to those collections, the *Index Catalogue*, steadily increased in value as a new volume appeared in print every year. Appropriately, the final volume of Series One appeared in 1895.

Much more dramatic, of course, as an example of the ongoing Billings program, was the long-awaited completion of the two pioneering institutions he was associated with at Johns Hopkins University. The opening of the Johns Hopkins Hospital in 1888 in Baltimore, though anticlimactic in some respects, was celebrated as the epitome of the up-to-date healing institution. At the same time, Billings had been already widely emulated by other builders for his meticulous hygienic arrangements in and out of the buildings, particularly his elaborate ventilation and heating system. He had been well aware that changes in man's knowledge of germs would require modifications of those arrangements before too long. That did become necessary in the 1890s. Meanwhile, the university's School of Medicine finally opened in 1893, with Billings's plans for its staffing, science-based curriculum, and functioning already being widely discussed and beginning to serve as the American model for other such forward-looking institutions.

Equally important in other ways for many late nineteenth century health officers and physicians in general were Billings's still-unfinished vital statistics publications and other labors for the federal census. But he was, in addition, widely thought of for his ongoing encouragement of the use of statistical methods in sanitary investigations, medical reports, and other tasks, particularly to trace the locality and distribution of disease. Although he never mastered higher mathematics to the extent that Britain's William Farr had, he nevertheless enjoyed continuing respect as one of America's most learned and important statisticians.

Actually, whatever Americans recalled about or gained from Billings as a scholar or investigator, many 1890s sanitarians, physicians, health boards, and even certain legislators were still thinking about him primarily as a public health administrator. They felt strongly that he had been an ideal leader of the National Board of Health and regretted that he had not been able to remain longer in that or some other federal agency. However, their occasional efforts to revive or replace the Board remained frustrated until later in the Progressive era.

The entire ranks of American health professionals and physicians should have expressed gratitude to the departing Billings for a far longer-lasting and more successful role that he played throughout his Army medical years. This was as the country's leading intellectual guide through the conflicting concepts and procedures that made up the ferments of the bacteriological

age. He was a tireless sorter and analyst of other peoples' theories. And rather than propose theories of his own, he made himself into a scientist, with competence to contribute factual knowledge of his own but especially to be able to evaluate the factual knowledge produced by other laboratory researchers, statisticians, technologists, and varied investigators. In the professional societies and journals, Billings then became the informed educator about germs and their behavior as well as about other agencies proposed as causes of disease. And as publicist, he passed on reports about relevant research in progress and stressed the importance of basic research equipment and methods as well as the creation of laboratories themselves.

Billings remained an enthusiastic advocate of a major role for bacteriology in public health work. But he was never blind to the values of certain other scientific tools, notably technology and statistics, in helping bring about the flourishing of the medical revolution. Historians have not always recognized the breadth of this commitment.

Epilogue

Outside the Army; Other Paths to Science

In accepting his new appointment with the New York Public Library, Billings made it clear that he would not cut himself off entirely or all at once from his interests and contacts in medicine, public health, and science. After going to New York, he thus kept himself available to Sternberg and Robert Fletcher, the latter in order to keep abreast of the problems of the Army's medical library, and he rarely missed meetings of the National Academy of Sciences. He likewise continued to join and participate in the functions of selected new societies or interest groups as diverse as the Charaka Club (for medical historians and humanists) and the Nurses Pension Fund Movement. Occasionally Billings also took time off to work on designs for new hospitals or to attend medical or public health congresses. And, not least, during his first years at the new Library he scrupulously worked to honor his commitments to finish up certain large medical or scientific projects that had been begun in the early 90s in Washington. Chief among those labors were his lengthy analyses of vital statistics for the census, some of which extended to as late as 1902, while his editorial work for the Committee of Fifty's reports on *Physiological Aspects of the Liquor Problem* lingered on until 1903.

Despite such commitments, Billings's overriding preoccupation now was the array of enormous and complex problems associated with developing the New York Public Library, an enterprise that everyone who knew him agreed was ideally suited to his energies, organizing talents, and intellectual interests. Details of the seventeen years that he subsequently spent in shaping and building up this great institution cannot be discussed at any length here.¹ However, I will comment on one element of that work that led him to a final striking reinvolved in America's life of science.

¹ See Dain, *New York Public Library*.

Prominent among Billings's pursuits between 1899 and 1901 were his efforts to work out mergers of the city's small free circulating libraries into the central library system as well as to identify sources of financing for new branch libraries around the city. Among his many discussions of these and other library matters during this time, some of the most challenging and ultimately fruitful were with the wealthy industrialist Andrew Carnegie. In the course of those meetings, Billings distributed copies of an ambitious plan for a large network of branch libraries, including their anticipated building costs to the city. Carnegie thanked the other man but gave no immediate indication of what he thought of it. However, in early 1901, after Carnegie had completed the sale of his steel works to J. Pierpont Morgan, the industrialist announced that he was ready to begin practicing his "gospel of wealth" in a larger way than before. Specifically, he decided to extend more of his new large philanthropies to libraries, including a very large donation to the New York Public Library. Writing to Billings, he noted that "our conferences upon the needs of Greater New York for Branch Libraries to reach the masses of the people in every district have convinced me of the wisdom of your plans." Accordingly he awarded New York City the entire amount that the other man had suggested, \$5,200,000 to build sixty-five branch libraries, a stunning gift at the time.²

The Carnegie award had varying consequences for the persons involved. The press and city politicians alike saw its potential benefits for improving the educational opportunities of ordinary citizens. Billings and the Library trustees, in turn, were gratified with this substantial advancing of their plans for branch libraries, but they also knew that they would now have to raise other large amounts in order to properly staff, supply books and periodicals, and otherwise equip the new installations, as well as provide for continuing upkeep.

Andrew Carnegie was doubly pleased. For one thing, he had successfully reduced his bank account somewhat, even though huge amounts still

² For details, see *Ibid.*, pp. 209-247; and Chapman, *Order Out of Chaos*, pp. 302-306. Chapman's quotation from Carnegie's letter to Billings of March 12, 1901, is on pages 304-305. Carnegie, in his well-known essays on "Wealth" (later changed to "The Gospel of Wealth"), presented his dictum of the moral obligation of the rich, before dying, to return their holdings to society through philanthropic works. Andrew Carnegie, *The Gospel of Wealth and Other Essays* (New York: Century, 1900).

remained to give away. Of at least equal consequence, however, was the immensely favorable impression that he had gained from his discussions with Billings of the latter's versatility, thoroughness, incisiveness, and rapid grasp of detail, among other traits. In fact, from the beginning a favorable chemistry seems to have existed between the two men, enhanced undoubtedly by the mutually large scale of their vision and their achievements. Relations between them seem never to have been complicated by any of the bitterness toward Carnegie that still lingered in American society as a result of his and his steel firm's infamous handling of the Homestead Strike of 1892. Like many other academics and scientists a decade or so after that event, Billings apparently did not consider the other's large philanthropies as being made with "tainted money." Moreover, the success of their work relations was also aided by the refusal of both men to allow their differences in wealth to stand between their respect for and appreciation of the other as an individual.

Carnegie thus had no hesitation about moving on from the branch library discussions to utilize Billings as advisor on other proposed philanthropies, while Billings in turn readily took the necessary time off from library matters to help out in what he regarded as an important undertaking on Carnegie's part. It is not clear how many different proposals Billings became involved in or how much of his time was involved. However, it is evident that his work as one of the principal Carnegie advisors did expand steadily after 1901. As one indicator of this, by the end of that year, to facilitate their communications, Carnegie had made available all three of his telephone numbers to Billings, one of them a private line.³ Moreover, the two began meeting more often for dinners, concerts, the theater or other social events.

At some time during the spring or summer of 1901 Carnegie asked Billings to participate in some early discussions concerning possible support of large ventures in education, the sciences, or both. Two prominent university educators, President Andrew D. White of Cornell and former President Daniel C. Gilman of Johns Hopkins, were already trying to interest Carnegie in supporting some form of national university. At the same time, various individuals in Washington, including the Director of the United States Geological Survey, Charles D. Walcott, were promoting a broad type of educational institution that could serve as a suitable memorial to George Washington. During the summer, Carnegie invited White, Gilman

³ See Billings's manuscript *Diary for 1901*, unnumbered page at the end, in JSB papers NYPL, copied on NLM MS film 25, Reel 61.

and Billings to continue the discussions with him at his so-called "castle" in Scotland. Afterward, Billings briefly wrote a friend about his "interesting" several days there, which seem to have been launched "every morning at seven thirty by the bagpipes played under my window, and [being] marched solemnly into dinner every evening to the strains of the same ferocious instrument."⁴ Subsequently, he resisted other such invitations because of Carnegie's stringent limitations on smoking in the castle.

During the discussions in Scotland, Billings let it be known that he did not favor much of what was in the various proposals. He did agree that the city of Washington would be the appropriate site for whatever type of institution was settled on. Before the meetings broke up, however, he began suggesting that Carnegie consider creating an institution that would focus on supporting urgently-needed original scholarly research in America, research in science first and foremost to be sure, but also in other areas of learning. By mid-November, back in New York, when Carnegie asked Billings and Gilman to argue the various proposals with him one more time, Billings submitted a rough outline of his thinking. In it he "advised instead of a university [that] the institution be founded for the promotion of original research, advanced teaching, etc., to be located in Washington, to be so original as not to interfere with the work of any existing university, but on the contrary to assist them, and to grant scholarships, etc., for work in laboratories and institutions outside of Washington as well as in it."⁵

Impressed by Billings's presentation, Carnegie enthusiastically accepted the basics of the plan and then sat down with Billings and Gilman to work up a more polished and detailed version. That done, he almost immediately established the Carnegie Institution of Washington as one of America's

⁴ Billings's letter is quoted in Garrison, *Billings*, p. 306. For further details on these discussions, see Howard S. Miller, *Dollars for Research: Science and its Patrons in Nineteenth-Century America* (Seattle: University of Washington Press, 1970), pp. 166-173. There is, up to the present, no full-scale scholarly history of the Carnegie Institution of Washington.

⁵ For a selective but perceptive study of the origins and internal politics of the Carnegie Institution, see Nathan Reingold, "National Science Policy in a Private Foundation: The Carnegie Institution of Washington," in Alexandra Oleson and John Voss, ed., *The Organization of Knowledge in Modern America, 1860-1920* (Baltimore: The Johns Hopkins University Press, 1979), pp. 313-318. The quotation is on p. 317.

earliest research foundations, one that was made public at virtually the same time as the launching of the Rockefeller Institute for Medical Research. In December 1901 he bestowed an initial grant of \$10,000,000 upon the new institution and went on to name its initial trustees.

As these developments unfolded, Billings made himself available, with little or no hesitation, to do whatever else he could to make the new foundation a success. For his part, Carnegie tried to make sure that Billings, together with Gilman and Walcott, would continue to bring their wisdom, energy, and leadership to the enterprise, at least through the early formative years, and thus provide continuity to the planning, organizing, and setting in motion of the institution's research support structures and programs. Possibly after consulting with Billings and others, he thus installed Gilman as President and obtained Walcott to be Secretary, and then ensured that Billings would remain at the center of things by placing him simultaneously as a trustee, as one of the seven-man Executive Committee, and from 1903 onward as Chairman of the Board of Trustees.

Serving in these capacities for the rest of his life, Billings thus remained as one of a troika of eminent leaders in this elite body of savants, nearly all of whom were brilliant in one field of learning or another. Walcott apparently got along well with the other two leaders as well as with the other trustees, and he stayed as Secretary through the period. Gilman, however, who was not always on good terms with Billings and was frustrated at not having as much power as he wanted, resigned the presidency in 1904. After a search for a replacement, Billings ultimately got his associates to settle upon a geophysicist, Robert S. Woodward, for the job.⁶ Years earlier in Washington, he had known and was comfortable with the capable Woodward. And the two now seemed to have found that they could work reasonably well with each other in this new situation even though

⁶ In connection with the subsequent search for a replacement, there appears to have been a distinct possibility, though apparently not documented, that Carnegie or someone else attempted to interest Billings in becoming a candidate for the presidency. If the latter had been at all interested, he would have had to notify the New York Public Library trustees at an early date, since election to the presidency would have required him to leave the library position. At any event, it is known that the trustees during this period, justifiably alarmed at the possibility of losing him, voted the first of several sizeable bonuses for Billings. Dain, *New York Public Library*, pp. 90-91, describes the bonuses.

both were strong-minded individuals.⁷ They agreed that the health of the Institution demanded an assurance of there being a variety of honest opinions freely given.

Since the Carnegie Institution had been chartered in Washington, D.C., these and its other officials conducted most of their business in that city, for the first several years in rented quarters and hotels. For Billings, of course, the satisfying of that requirement meant his being ready and willing to take whatever train trips between New York and the Capital were necessary. Actually, meetings of the executive committee alone were scheduled for almost every month, and Woodward and others were impressed that Billings, despite occasional illness, missed so few of them.⁸

Central among the items of housekeeping business that the executive committee discussed from time to time during the Institution's early years was the question of a permanent administration building. At some point, Billings gave specificity to those discussions by circulating his views of what kind of building was desired, the number and kinds of rooms, the dimensions, the functions to be served, and so on. And in general, he concluded, "The building should be severely plain, but dignified and as nearly fireproof as practicable. Special pains should be taken to secure good ventilation in all parts of the building, so that life in it may be tolerable during a tropical summer."⁹ Subsequently, Billings seems to have been the official who enlisted the architectural services of Carrere and Hastings, the same firm he was working with on the New York Public Library building.

⁷ Reingold believes, probably correctly, that Woodward bested Billings in some of the Institution's policy power struggles. Nathan Reingold, "National Science Policy," *loc.cit.*, pp. 315-317. However, I disagree with his conclusion that this struggle resulted in permanent "bitter enmity" between the two men. For a contrasting picture of what seems to have been a generally cordial relationship, see Woodward's extended "Reminiscences of Dr. Billings," quoted in Garrison, *Billings*, pp. 348-356.

⁸ Robert S. Woodward, "Report of the President of the Carnegie Institution of Washington, for the year ending October 31, 1913," *Yearbook of the Carnegie Institution for 1913* (Washington: The Institution, 1913), pp. 8-9.

⁹ [J.S.B.], "General Requirements of Proposed Building," undated MS in JSB papers NYPL, Box 58 (Carnegie Institution of Washington). See also "Report of the President, 1908," *Yearbook of the Carnegie Institution of Washington*, No. 7 (Washington: The Institution, 1908), pp. 24-25.

He also provided general oversight of the builder and other contractors. In the process, he gained the admiration of Woodward and other engineers among the trustees for his proficiency in reading blueprints.¹⁰

A contract for construction of the new building was awarded in January 1908 for an estimated \$221,000. It became ready for occupancy late the next year, some eighteen months before the formal opening of Billings's other current major building project, the New York Public Library's central building. In December 1909, a two-day program was organized to mark the opening of Washington's new science facility. On Monday, the 13th, the executive committee met in the afternoon, while in the evening, Billings as Chairman of the Board of Trustees, presided over the dedication program, which featured remarks by Elihu Root and Andrew Carnegie, and a scientific lecture by George Hall on the new solar laboratory, followed by a reception. The second day was taken up by a trustees' luncheon followed by the annual trustees meeting, another meeting of the executive committee, and the trustees' dinner at the New Willard Hotel. On the next two days the public was invited to see the new building and its special exhibits.¹¹

During the Institution's early years, the officers, trustees, and advisors spent much time in identifying the areas of science and learning that most needed research stimulation. They organized themselves into research departments for the main areas of interest and recruited able scientists to head them; by 1908 there were ten such departments. The officers and members also gave much attention to one of the Institution's stated objectives, "to discover the exceptional man in every department of study whenever and wherever found," though in practice the identifying of significant needed research was often easier than finding outstanding individuals to do it. Billings himself particularly pushed his associates to support Robert Fletcher's application for funds to revive publication of the *Index Medicus* as well as the project of Charles Davenport for a Station for Experimental Evolution.¹²

¹⁰ Woodward, "Reminiscences," in Garrison, *Billings*, p. 353.

¹¹ "Dedication of Administration Building," document dated 1909, in JSB papers NYPL, Box 58 (Carnegie Institution).

¹² For a summary of this stage of the *Index Medicus*, see Miles, *National Library of Medicine*, pp.211-212. For the early history of the Station for Experimental Evolution, see report of the Department of Experimental Biology, in Carnegie Institution of Washington, *Year Book*, No. 3, 1904 (Washington: The

However, he also gave his support to such diverse proposals as those for laboratories of geophysics and nutrition, a project in marine biology, and a department of historical research.¹³

As Chairman of the Board of Trustees, Billings was occasionally called on from time to time to represent the Institution at special events. However, the core of his service to the Institution, and the source of his greatest satisfactions in it, lay in the regular meetings of the executive committee with their meticulous ongoing evaluation routine of planning, discussion, contention, and compromise of program proposals. Other committee members occasionally complained that, in participating in these functions, Billings was abrupt, domineering, or otherwise too much the former army officer. But nearly all of them seemed to feel that he was nevertheless an outstanding committee man, one who, more often than anyone else, recognized the strengths and weaknesses of proposals or policy arguments.

A particularly perceptive assessment of Billings's work for the Institution and appreciation of his importance as a man of science was made by one of the non-scientists on the executive committee. This was the brilliant public servant and jurist, Elihu Root, who admiringly observed Billings's performance throughout all of the other man's eleven years of service. As one result, he came to consider Billings as a role model for the other trustees, and doubtless for scientists everywhere, because of the traits that he brought to the executive committee's demanding scientific procedures. Root summarized them at the memorial services for Billings in 1913: "The breadth and variety of his learning, the definite certainty of his knowledge, the catholicity of his interest in all matters coming within the field of science, made his opinion of the greatest value. His service was devoted and untiring. He had intellectual as well as moral integrity, and a rugged independence of character which commanded recognition and respect. He came as near as any man I ever knew to absolute independence of judgment, and he was so simple and natural and unhesitating in his expression that his positive differences of opinion created no irritation. No project or expenditure could pass his scrutiny by easy or indolent acquiescence but only as it approved

Institution, 1905), pp. 22-49. Billings's brief remarks at the opening of the Station are on pp. 37-38.

¹³ Summarized in Garrison, *Billings*, pp. 354-355.

itself to his experience and reason. Yet he was essentially constructive and progressive in his views and wishes, and he was simple, modest, unassuming, without pride of opinion or personal bias. He never advertised himself or vaunted himself."¹⁴

¹⁴ Elihu Root to John D. Cadwalader, 4/23/1913, in The New York Public Library, *Memorial Meeting in Honor of the Late Dr. John Shaw Billings, April 25, 1913* (New York: The Library, 1913), p. 15. Other original and valuable appreciations of Billings in this same volume include those by William H. Welch on Billings in public health and medicine (pp. 10-13); by William Osler on Billings as medical bibliographer (pp. 8-10); and by Andrew Carnegie (pp. 13-14).

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Omitted from the index are such obvious topics as Public health, Hygiene, Sanitation, Statistics, and Science. These subjects pervade all aspects of Billings's career and are, in one way or another, the subject of every chapter. Only a few headings are given under Billings's name, and those are ones that refer to him personally rather than his career. Obviously, every index heading has a relation to Billings.

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Much has been written about John Shaw Billings's (1838-1913) role in the founding and development of two great American libraries, the Army Medical Library and the New York Public Library, to the neglect of other aspects of his career. Billings's role as a physician was many-faceted. Beginning his medical career as an Army surgeon during the Civil War, during the next 30 years he added to his medical skills those of scientist, administrator, and planner, builder, and organizer of several important medical and public health activities and institutions.

This book explores Billings as a leader of the "medical revolution" and the public health movement of the late 19th century. It emphasizes the part he played as a link between the growing federal government's presence in health policy and scientific activity and the world of private medicine and local public health.



James H. Cassedy spent more than 35 years as Historian in the History of Medicine Division of the National Library of Medicine in Bethesda, Maryland, where he was editor of the annual *Bibliography of the History of Medicine*. Among his many publications are *American Medicine and Statistical Thinking, 1800-1860*, *Medicine & American Growth 1800-1860*, *Medicine in America: A Short History*, and *Demography in Early America: Beginnings of the Statistical Mind, 1600-1800*.

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